



FRIDAY, SEPT. 4.

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Contributions.

Two Cylinder and Balty Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It seems to me that "Two Cylinders" is unnecessarily alarmed about the status of the two cylinder compound locomotive in the minds of the makers and users of locomotives. He should be reassured by the fact that of the 1,200 or so of compound locomotives in the world, nearly all of them are of the two cylinder type, and by the fact that almost everybody advocates them. He should also remember that his favorite type of engine has almost uniformly shown a fuel saving of 20 per cent. when compared with simple engines equally carefully designed. As 20 per cent. saving is all that is usually claimed for compound engines in stationary service, it appears that the two cylinder compound locomotive is doing all that can reasonably be expected from any compound engine. When the saving is more than 20 per cent., it is not because the compound locomotive is so good, but because the simple one with which it is compared is so bad. The savings now being reported in this country are, so to speak, fictitious, because much more care is used in the design of compounds than ever was thought of in simple engines. The anxiety to have them succeed begets all sorts of "saving" ideas. On this point I can speak from experience.

As for cylinder ratios, there is no difficulty in having any desirable ratio, for if one low pressure cylinder cannot be used, two can be, one above the other (see Lepage's patent), with one steam chest and valve, and ports not only in the usual way for the upper cylinder, but from one cylinder to the other. This would in spirit be an engine of the two cylinder type, if in fact it is a three cylinder engine. The pressure on the two low pressure piston rods would be equal and it would thus be what we usually call a "mechanical job." With a small wheel the cylinders might have to be inclined, which, while not pleasing to persons whose sentiment steals off with their sense of propriety, is nevertheless permissible. With such an engine having a cylinder ratio of two to one, all pistons and cylinder heads would be alike.

Now as for cylinder ratios, I trust that "Two Cylinders" will excuse me if I say that he is apparently not aware of the fact that the power of a compound engine, or of any multiple expansion engine, depends solely upon the size of the low pressure cylinder, the ratio of expansion being the same. Thus a certain low pressure cylinder is necessary no matter what may be the size of the high pressure. Cotterill's words on this phase of the case are worth quoting. He says:

"The work done by a given quantity of expanding fluid does not depend in any way on the particular machinery by means of which the expansive energy is utilized."

"Thus when 1 lb. of water is forced into the boiler and evaporated, the resulting steam expanded, exhausted, and finally condensed, the work done by it does not depend on the number of cylinders through which it passes during the series of changes it undergoes, but simply upon the pressure of admission, the ratio of expansion, and the amount of heat it received during the process."

"The weight of steam used depends upon the size of the large cylinder or cylinders alone, because at every stroke the volume of steam discharged is that of the large cylinder, and hence the power and efficiency of a compound engine (are other things being equal) the same as if the steam were used in the large cylinder alone with the same total expansion."

"The addition of a high-pressure cylinder, then, has in

itself no influence on the power or the efficiency of the engine; it is merely a device for partially overcoming some of the difficulties which attend the use of high grades of expansion."

"Two Cylinders" doubtless now sees that he cannot narrow up the L. P. side of his engine by making his H. P. cylinder large.

As for cutting off early in the H. P. cylinder, it is inconsistent with the shortcomings of a single valve reversing valve gear. All locomotives, especially those for high speed, ought to have independent exhaust valves, but the compound locomotive needs them much more than the simple engine. With such a gear "Two Cylinders" could cut off as early as he might wish in his H. P. cylinder provided he would not cut off too early in the low pressure. This is another snag in the way, as the L. P. cut-off for continuous expansion in a quarter crank engine depends upon the cylinder ratios. For a ratio of 2 to 1 the L. P. cut-off should be at half stroke, and for 3 to 1 at one third stroke, and so on, no matter where the H. P. point of cut-off is. Strict attention to this point is, however, useless in a fast running engine, as nothing occurs as desired.

Recently two writers in the GAZETTE, signing themselves "Compound" and "Compound, Jr.," have witnessed efforts of two cylinder engines to start heavy trains without unqualified success. One engine had a leaky intercepting valve, and the other had none print whatever. "Compound" was evidently much impressed by what he saw, and attached too much importance to it. "Compound, Jr.'s" engine appeared to have a low pressure valve with some lead in full gear. The low pressure piston slowly got into a position where its lead stopped it and tended to rotate the wheels backward, and the receiver pressure tended to check the high pressure piston from turning the wheels forward, with the combined result that the engine was then unable to move. "Compound, Jr." hides his light under a bushel and asks somebody to guess by means of what simple expedient the engine was started. Most likely the receiver was "bleed." This might be done by lifting the air relief valve on the L. P. steam chest, or by opening one water relief valve, if the engine had them, or by opening the cylinder cocks. The forward effort of the high pressure piston would then meet with no opposition.

F. W. DEAN.

Shop Notes at Milwaukee.

Much progress is now being made by the Chicago, Milwaukee & St. Paul on freight car equipment. They have just completed at their Milwaukee shops the erection of a large building to be used exclusively for new freight cars. The structure is 400 ft. long by 104 wide, and contains five tracks running its entire length, giving room for ten cars on each of four tracks, in various stages of completion, besides one track for putting up the trucks. Calculations are made for having twenty trucks ready by noon to be shifted to a second track, where another gang puts on the sills, flooring and upper frame, the top part of the car being finished by a third gang, and after the car is fitted with airbrakes and Janney couplers, the former being thoroughly tested in each car, the painters are brought over from the other track. During the process of construction the car passes under the hands of several gangs, there being ten gangs on each track, so that each has in hand a car, and their work is controlled by a gang-boss, who is, however, one of the workmen, they in turn being under the shop foreman.

By a system of hanging platforms between the tracks on which the siding and roofing material is stored the upper and lower gangs may work without interference and to much better advantage. This material is switched over from the planing mill, which stands on the opposite side of the yard but adjoining the lumber yard, on high and low trucks of large capacity, and being handled in quantity this way is easily transferred by engine at convenient times of the day. A good surplus supply is constantly kept on hand at the end of the shop for emergency in case there should be trouble at the planing mill. The transoms, archbars, hangers, etc., are brought over from the smith shop and piled along the side of the erecting shop, and from thence brought in through side doors.

This shop is built with a low flat roof with admissions for light at intervals, so as to throw the light forward and back. No heating apparatus has as yet been put in, and it has been somewhat of a question as to what system would prove the best.

They are now turning out 10 cars per day, and expect to keep this up indefinitely, as for a road of this size it requires about this number to supply the demand. These cars are 60,000 lbs. lumber line, 34-ft. box cars, with swing beam trucks, having air brakes, Janney couplers, national hollow brake beams and Hutchins' roofs. By a thorough attention to details of systematic working it has been found that they are enabled to build cars at this point for less per car than the lowest bid they have been able to obtain at any time.

The spring plank cross bar hanger is made of heavy square iron with the ends formed under a hammer into an oblong head, which is slipped through the long spring-plank hanger, and after being turned one quarter round is bolted up to the plank. The bolsters are made of a single piece of oak grooved at the sides for tension rods. Among other labor-saving machines spoken of is a socket wrench operated by electricity by means of a flexible connection, for screwing up the nuts at the lower end of the

arch bar bolts. By this a man may turn up very quickly a large number of these nuts, and the saving will be greatly appreciated by any one who has ever watched the average wrench hand at work on this part of the truck.

It is expected that work will soon commence on cars having a somewhat larger body than the present standard. The design is similar to that now followed, except that the height inside is to be increased 12 in. and the width 8 in., to meet the demand from the freight department for a greater carrying capacity for bulky materials, such as carriages. This rivalry on the part of the Western lines has resulted in producing rolling stock which makes the cars of a few years ago look quite diminutive, and has been on some roads a source of considerable profit. The height of the roof being limited by overhead bridges and viaducts has in many instances led to the adoption of a lower floor line and cutting into the end sill for the drawbar, which, though the pull and thrust is taken direct by the centre sills, still destroys largely the strength of the end sill; and the advantages of the design are much disputed in various places.

The foundry at West Milwaukee; besides turning out all the regular engine and car castings used, and cast iron pipe of the smaller sizes, makes a great quantity of culvert pipe up to 5 and 6 ft. in diameter. Such piping is used exclusively not only by this road, but also by a number of other lines west of Chicago for culverts, and it answers the purpose exceedingly well, is easily handled, and will need but slight attention for an indefinite length of time. The output of 33-in. wheels is here entirely made in the Barr contracting chill and amounts to 100 per day, and the Congdon shoes are made at the rate of 1,200 per day.

In the planing mill and wood-working shop there are a number of special machines and methods of handling. In instances the cutters are doubled up so that a single move on the part of the operator will accomplish several results, and frames are used so that curves may be cut on circular saws rapidly and accurately.

Mr. Barr is obtaining some very excellent results with a boiler purgen. A number of boilers are making large mileages and have been out of the shop much longer than usual. Of course, any comparative estimates should take into consideration the quality of the different waters along the line, some of which are very good, while others are quite the opposite. One engine, which has been out about two years and nine months, and which has made over 150,000 miles, has her flues and sheets still in as good condition as they were at the end of the first month. The entire success of any of these purifiers is due to the systematic attention paid by those in charge of the engines at the terminals, and the drivers, to putting into the water the proper amount of the purge, and to drawing off the water from the boiler and tank at regular stated intervals. As is well known, whenever this method of bettering the water is introduced on a road, for the first few months there is a decided change for the better on the few engines under the eye of the master mechanic; but just as soon as the purge is "adopted" and used on all the engines of the division, just so soon will the benefits begin to disappear; for the runners and others become lax about the amount they put in and when they put it in, and other details, close attention to which are absolutely essential, and they seem to think that this new experiment is going to prove a panacea for all their ills. Here much effort is made to guard against this falling off, and to the close watching is given the credit of the success so far attained.

It will probably be of considerable interest to many that this company is now using Krupp steel tires instead of the domestic or other foreign makes, notwithstanding the fact that the American tires may be purchased for one-third the price of the Krupp per pound. It is held here that these tires give very much better service per 1/8 in. of thickness, and also that by the use of this superior quality of tire a great decrease in the cost of repairs on the engine is the result; that the rapid wearing of an inferior tire in spots and lines causes pounding and racking of the engine and the breakage and deterioration of the springs, wedges and other parts, as well as a straining of the frames, and leaky flues. In order to determine the effect of the two qualities of tires, this road equipped 45 engines with Krupp tires and 45 with American tires. These were put into service about five years ago, the engines of both lots being the same in every other respect, and used in the same general class of service. By keeping a close account of the figures it is found that the engines with Krupp tires cost \$1,054 less on an average for repairs than those with American tires, or about \$200 less per engine per year. This experiment was not tried on a small scale, neither was it subject to the eccentricities of a test on "switchers" (as these were road engines), so that the results obtained would seem to indicate that there was a marked difference between the two classes, a part of which would at least pay for the extra price per pound of the tire, even supposing that but one-half of this extra cost for repairs was due to the grade of metal and workmanship in the tire.

The company has just finished the design and construction of a "class C" engine of the six-wheel pony type, for heavy switching at the ends of some of the larger yards. The engine has a 12-ft. wheel base and is an 18-in. x 24-in. The boiler is 54 in. diameter, with radial stays, and contains 172 2-in. flues, 12 ft. long, of No. 11 Birmingham wire gauge. The firebox is 6 ft. 6 in. x 20 in.,

the narrow width being due to its sitting down between the driving boxes, instead of cutting the sheet away and framing a pocket for the box and having the outside sheet close to the tires, as is frequently done. From below the flues to above the door there are three 3-in. bent

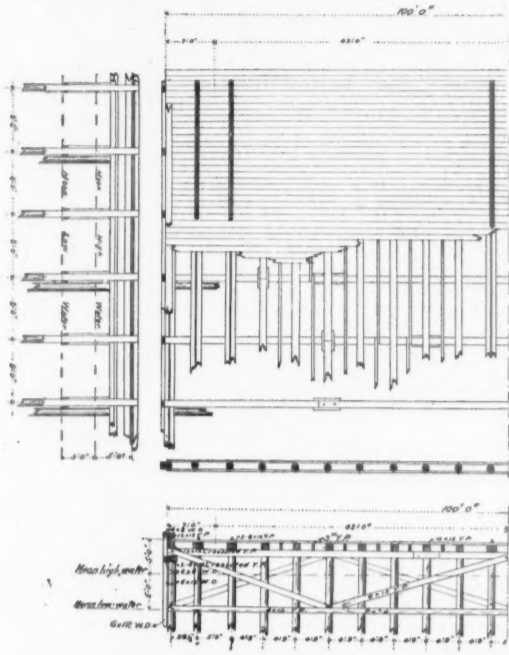


Fig. 1.—Open Pier.

arch tubes, which are beaded and caulked at their ends the same as the flues. Two 2-in. air tubes are placed on each side of the box a few inches above the grates. According to the custom followed here, the stack is of the bootleg type, but has a straight barrel inside. The engine weighs 90,000 lbs. and carries 180 lbs. of steam.

Jersey City Freight Terminus—Lehigh Valley Railroad.

[WITH AN INSET.]

The new freight terminus of the Lehigh Valley Railroad in Jersey City, N. J., built within the last three years, offers a number of points of interest to the engineer and railroad man, as well as to the public generally, not only as one of the most recent examples of railroad terminal development in the vicinity of New York, but also as a clear indication of the enormous strides and quiet but persistent efforts with which the Lehigh Valley Railroad is pushing forward to rank as one of the important trunk lines. This terminus is only part of a large series of improvements the railroad company has in progress, and its through line from Jersey City to Buffalo, when completed, in connection with its efficient fleet of lake steamers, will give direct and quick service from all important lake ports to New York.

The terminus in question is situated on the Hudson River in the Communipaw section of Jersey City, immediately north of the terminus and ferry of the Central Railroad of New Jersey, as shown in the large plate on the inset. The property consists of about 150 acres back of the pier line of Hudson River, and comprises mainly the old "Morris canal basin," the "Morris canal grant" and the "west line grant," with several large additional tracts. The total frontage on Hudson River, embracing the Morris canal basin and the Morris canal grant, is 1,535 ft., while the property extends inland more than a mile from the waterfront. Freight for this terminus leaves the main line of the Lehigh Valley Railroad at Roselle, N. J., and reaches Jersey City via the Central Railroad of New Jersey.

The Morris canal grant, about 1,000 ft. front on the river and extending back to Washington street, together with the west line grant, adjoining and lying on a basin 2,800 ft. long and 500 ft. wide, established by the State of New Jersey in 1872, was acquired by the Lehigh Valley Co. This gives it about one mile of water front on ample basins lying at right angles with the river.

The development offered some very interesting problems, and gave a wide field for new ideas. The plan finally adopted, consists in establishing a ship channel, running inland perpendicular to the water front for a distance of about a mile, with piers adjoining it, and running toward it and the Hudson River on a 30-degree angle, or in what has been called saw-tooth fashion. It will be readily recognized by a glance at the accompanying plans that in this manner a very large water front can be secured (aggregating over three miles), easy of ingress and egress, and with the additional advantages of offering short slips and short

piers. In the lay-out of the yard particular stress was placed on the necessity of having ample track facilities, crossovers, leaders and open tracks, so as to allow switching engines to work simultaneously back of each pier without disturbing each other.

Work on the terminus was started March 20, 1888, and the freight was handled on Dec. 17, 1888. The following structures have been built thus far, in addition to the tracks, roadways and yard facilities, namely, two transfer bridges, for transferring New York freight in cars to and from car floats; two open freight piers, each 100 ft. x 600 ft.; two single-story covered piers, each 100 ft. x 600 ft.; one double story covered pier, 120 ft. x 580 ft.; also a local freight station, icehouse, storehouses, offices, etc. An additional double-story covered pier, 120 ft. x 580 ft., is now in course of construction.

The standard open piers, shown in fig. 1, are 100 ft. wide measured on the square, by 600 ft. long measured along the skew face. On one of these piers there are three tracks, one at the centre of the pier and one along each string piece. On the other open pier there are five tracks, one at the centre of the pier and two along each string piece. One of the open piers is equipped with steam derricks for handling freight. The floor is set 5 ft. above mean high water or about 10 ft. above mean low water. The pile bents are spaced 9 ft. apart, centre to centre, with 23 piles per bent.

The principal materials used in the open piers are as follows: Creosoted yellow pine bearing and brace piles, creosoted with 12 lbs. dead oil of coal tar per cubic foot; creosoted yellow pine 12-in. x 12-in. caps, 12-in. x 12-in. outside stringers, and two 8-in. x 12-in. outside range timbers, creosoted with 10 lbs. dead oil of coal tar per cubic foot; untreated Southern yellow pine 12-in. x 12-in. inside stringers and string piece, 4-in. x 12-in. floor joists, two 8-in. x 12-in. track stringers under each rail, and 3-in. floor plank; 6-in. x 12-in. oak fenders, 14 ft. long; 6-in. x 8-in. oak chocks between fenders; and oak cluster piles at exposed corners.

The standard single-story covered piers, shown in fig. 2, and on the inset are 100 ft. wide measured on the square, by 600 ft. long measured along the skew face, while the sheds are only 33 ft. wide, out to out. There is one track running into the shed on each pier and another track running outside the shed on the south side of each pier. This arrangement is a combination of an incoming and outgoing freight pier; it gives a chance to ship or receive carload freight directly over the string piece, while packing freight with a probable short storage is stored in the

sashes, the latter hung on centre pivots and operated with cords from below. The shed is roofed with 1-in. tongued and grooved hemlock boards, covered with Gilbertson's old method tin laid on two layers of single-ply rosin sized building paper.

The standard double-story covered piers shown in figs. 3, 4, 5 and on the inset are 120 ft. wide measured on the square, by 580 ft. long, measured along the skew face; the sheds are 117 ft. 4 in. wide out to out. There is one track running into the shed on each pier at the centre of the shed. These piers are mainly intended for east-bound freight where a certain amount of storage has to be provided for. There are two stories, the lower one giving 10 ft. clearance between the bents, the upper one 8 ft. clearance at the bents and more between them. The entrance doors to the engine track in the pit are steel shutter roller doors. Four movable freight inclines or gangways are provided on each side of the pier, similar to those on the single-story covered piers.

Freight is transferred to or from the upper story by means of six Ruddell barrel elevators, operated by steam arranged to carry barrels, bags or package freight. By omitting the upper floor over the track pit, the height of the building was reduced, while the ventilation and lighting of the lower floor were greatly facilitated, and a heavy and costly girder construction to carry the upper floor over the track pit avoided, of course, however, with a certain loss of storage space. The top of the floor in the track pits is 4 ft. above mean high water, while the lower floor in the shed is placed 4 ft. higher. The pile bents are spaced every 9 ft., while the upper shed bents are spaced every 18 ft. The posts supporting the upper floor are spaced every 9 ft. lengthwise of the pier. The intermediate bents have 25 piles, the main or shed bents 37 piles per bent.

The principal materials used in the substructure of the double-story covered piers are the same as specified for the single story covered piers. The superstructure or shed is built of Southern yellow pine, 12-in. x 12-in. posts supporting upper and roof trusses; 12 x 12-in. floor girders under upper floor; 4-in. x 15-in. floor joists of upper floor bridged between supports and spaced about 18 in. centres; 3-in. upper floor; and 6-in. x 12-in. plates; also hemlock 4-in. x 6-in. intermediate studs, and 3-in. x 6-in. nailers. The outside sheathing of shed is No. 20 corrugated galvanized iron, and the inside is sheathed in both stories to a height of 7 ft. above the floor with 1-in. tongued and grooved hemlock. The roof trusses, built as shown, consist of white pine, two pieces 3-in. x

10-in. tie beams; two pieces 3-in. x 10-in. rafters; struts and ties, 2-in. hemlock, from 10 in. to 12 in. wide, and 3-in. x 10-in. hemlock purlins. The side trusses are tied across the track well with a 4-in. x 10-in. white pine tie beam, and the projecting parts of the upper floor next to the track well are suspended from the roof and supported by knee braces, as shown.

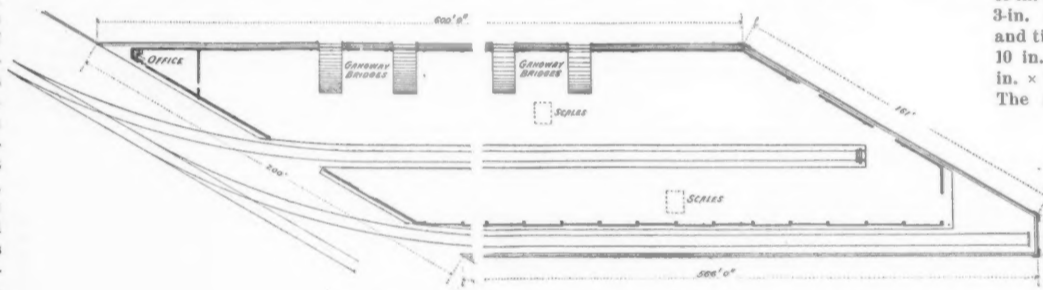


Fig. 2.—Single Story Covered Pier.

shed. The entrance doors to the engine track in the pit are steel shutter roller doors. Four movable freight inclines or gangways are provided on the north side of each pier, so that the inclines can be made to follow the tides or be adjusted to suit any boat, whether light or loaded. The south side of the shed next to the string piece track is built with a continuous system of rolling doors hung alternately on two different overhead rails, thus allowing any portion of the side of the house to be opened.

The top of the floor in the track pits is placed 3 ft. above mean high water, while the floor in the sheds is placed 4 ft. higher. The trusses in the sheds give 18 ft. 8 in. clearance above the floor under them. The pile bents are spaced every 9 ft., while the upper or shed bents are spaced every 18 ft. The intermediate bents have 21 piles, the main bents 23 piles per bent.

The principal materials used in the substructure of the single-story covered piers are as follows: Creosoted yellow pine bearing and brace piles, creosoted with 12 lbs. of dead oil of coal tar per cubic foot; creosoted yellow pine 12-in. x 12-in. caps, 12-in. x 15-in. outside stringers, 12-in. x 12-in. building sills, two 3-in. x 12-in. outside range timbers, creosoted with 10 lbs. dead oil of coal tar per cubic foot; untreated yellow pine 12-in. x 12-in. inside stringers and string piece, 4-in. x 12-in. floor joists, two 8-in. x 12-in. track stringers under each rail, and 3-in. floor plank; 6-in. x 12-in. oak fenders, 14 ft. long; 6-in. x 8-in. oak chocks between fenders, and oak cluster piles at exposed corners. The superstructure or shed is built of Southern yellow pine 10-in. x 10-in. posts, 8 in. x 12-in. plates; hemlock 4-in. x 6-in. intermediate studs, 3-in. x 6-in. nailers; the outside sheathing is No. 20 corrugated galvanized iron; the inside of the shed is sheathed to a height of 6 ft. above the floor with 1-in. hemlock plank. The roof trusses are built of white pine of the following sizes: tie beams, 2 pieces, 4 in. x 14 in.; rafters, 2 pieces, 4 in. x 12 in.; studs and ties, 2-in. plank from 10 in. to 12 in. wide; and hemlock purlins 3 in. x 10 in., properly bridged. The lantern is built of hemlock frame with white pine casings and

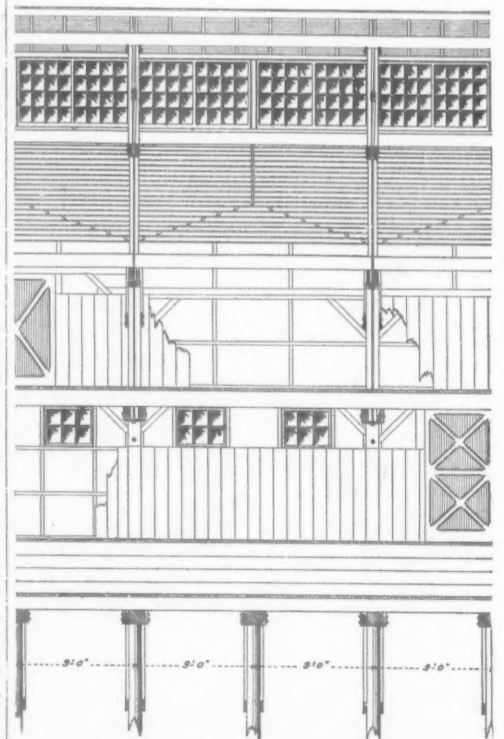


Fig. 3.—Double Story Covered Pier.

The lantern is built of hemlock frame, with white pine casings and sashes, centre hung. The shed is roofed with 1-in. tongued and grooved hemlock boards, cov-

ered with Gilbertson's old method tin laid on two layers of single-ply rosin-sized building paper.

Descriptions and plans of some of the minor structures, such as the transfer bridges, local freight station, canal drawbridge, local coal chutes, etc., will be published later.

These improvements have been designed and constructed under the general supervision of Mr. Robert H. Sayre, Second Vice-President L. V. R. R., and of Mr. A. W. Stedman, Chief Engineer L. V. R. R., and under the detail charge of Mr. Walter G. Berg, Principal Assistant Engineer L. V. R. R., assisted by Mr. Julius C. Hocke, Assistant Engineer L. V. R. R. The following contractors were engaged on the different classes of work, as mentioned: W. H. Beard, dredging; George W. Rogers & Co., the substructure of all the piers, the pile bulkhead platform and the wooden transfer bridge; D. S. Cofrode, the pile bulkhead; B. M. & J. F. Shanley, grading and filling; Joseph Jewkes, two single-story sheds and the local freight house; Levering & Garrigues, one double-story shed; and numerous other contractors on minor work.

Cleaning Surfaces by the Sand Blast.

For the past two weeks a new application of the sand blast to the cleaning of stone structures has been attracting attention where it is being tried in renovating the rather grimy exterior of the old marble building of the United States Assay Office on Wall street, in New

The work on Wall street has proceeded slowly for the reason that only one No. 2 Root blower has been employed and this has been operated under only about 60 pounds steam pressure, in addition to which the blower was placed so far from the "guns" that much power was lost from friction and leakage. The company having the work in charge is now arranging to procure sufficient steam, and at a more desirable point, so as to reach a normal rapidity of execution. During the past week the air pressure at the nozzle has been only $\frac{1}{2}$ lb.

Recently the "chilled iron shot," one of the triumphs of the Messrs. Tilghman, which practically revolutionized the art of stone sawing, especially in the case of granite, has been used in place of sand in the blast for cleaning iron work, such as armor plates and ship's bottoms. A number of bottoms were thus cleaned a short time ago for the British navy at the Portsmouth Dock Yard, and it is expected that the new method, which possesses the advantages of quickness, thoroughness and entire freedom from danger to the plates treated, will soon be tried in this country.

Recent Tests of Lime-Cement Mortars.

Gen. Gillmore, in his "Practical Treatise on Limes, Hydraulic Cements and Mortars," says: "Most American cements will sustain, without any great loss of strength, a dose of lime paste equal to that of the cement paste, while a dose equal to half to three-quarters of the

any, stronger than that with only 30 per cent.; and, consequently, where it is not desirable to use more than 60 per cent. it is not economical to use more than 30. A mortar with 30 per cent. cement, when four days old, is

COHESIVE STRENGTH.

		Pounds per square inch.							
Per cent. cement.		Age 4 days.	Age 7 days.	Age 14 days.	Age 21 days.	Age 28 days.	Age 35 days.	Age 42 days.	Age 49 days.
		4	8	10	13	18	21	26	26
0%	Lime M't'r	4	8	10	13	18	21	26	26
20%	Rosendale,	5	8 $\frac{1}{2}$	9 $\frac{1}{2}$	12	17	17	18	18
	Portland,	5	8 $\frac{1}{2}$	14	20	25	24	26	26
30%	Rosendale,	7	11	13	18 $\frac{1}{2}$	21	22 $\frac{1}{2}$	23	23
	Portland,	8	16	18	22	25	28	27	27
40%	Rosendale,	10	12	16 $\frac{1}{2}$	21 $\frac{1}{2}$	24	24	24	24
	Portland,	27	39	32	43	47	59	57	57
60%	Rosendale,	9	13	20	16	22	22 $\frac{1}{2}$	23	23
	Portland,	45	58	55	68	67	102	78	78
80%	Rosendale,	12	18 $\frac{1}{2}$	22 $\frac{1}{2}$	27	29	31 $\frac{1}{2}$	33	33
	Portland,	87	91	103	124	94	210	145	145
100%	Rosendale,	18	23	26	31	34	46	48	48
	Portland,	90	130	146	152	181	205	202	202

nearly 50 per cent. stronger than all-lime mortar, but the difference in strength steadily decreases, until at the end of 84 days the all-lime mortar is stronger. Apparently a small per cent. of lime decreases the strength of the mortar in a greater ratio than the proportion of the lime added, and such practice would seem not to be economical so far as strength is concerned. In the case of Portland cement it is evident that no advantage is gained

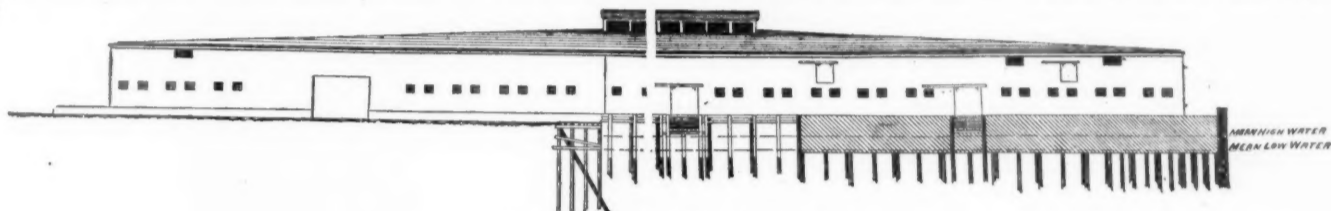


Fig. 4.—Double Story Covered Pier.

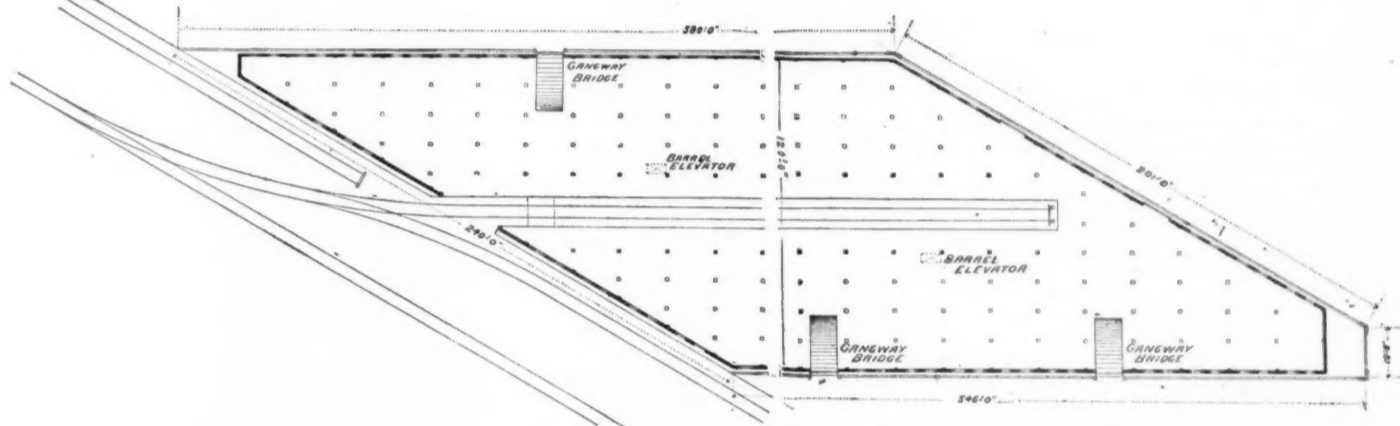


Fig. 5.—Double Story Covered Pier.

LEHIGH VALLEY FREIGHT TERMINALS—JERSEY CITY, N. J.

See the Inset for General Plan.

York. The process is an outcome of experiments by those able investigators, Messrs. B. C. & R. A. Tilghman, of Philadelphia, the original inventors of the sand blast which has within the past 20 years developed so wide a field of usefulness in the industrial arts.

In the earlier days of the sand blast the abrasive material was made to circulate through the fans and the whole length of the delivery pipe, to the manifest injury of the apparatus. Successive improvements have led to the design of a so-called "gun," four of which have been in operation at the Assay Office. This "gun" is an instrument about 3 ft. long, consisting of a tube of sheet tin $2\frac{1}{2}$ in. in diameter, bent at the forward end into a "goose-neck" form, and terminating in a 2-in. nozzle. A second tube, 1 in. in diameter, is fixed above and parallel to the larger tube, and enters it at the upper bend of the "goose neck" and terminates about 3 in. within, being accurately centered in that part of the tube which carries the nozzle. The sand is fed into the 1-in. tube from a hopper, and a flexible connection between the hopper and the tube leaves the "gun" free to be moved by the operator as desired in directing the blast against different parts of a wall. The air blast passing through the large tube draws the sand forward out of the smaller one. There is also a flexible rubber tube connection between the "gun" and the main air delivery pipe.

By the introduction of a small jet of steam into the air blast enough moisture may be provided to dampen the dust of abrasion, which would otherwise be something of a nuisance.

With an air pressure at the nozzle of about two pounds, one square foot of marble will be abraded to a depth of from $\frac{1}{4}$ to $\frac{1}{2}$ of an inch in one minute, leaving a fresh, clean surface. One can easily calculate the time required to renovate the exterior of a building at that rate, making allowance for erecting and removing the necessary scaffolding.

volume of cement paste may safely be added to any energetic Rosendale cement, without producing deterioration in the quality of the mortar to a degree requiring any serious consideration." This statement, together with the common practice, particularly in the construction of large buildings, to add hydraulic cement to lime mortar, on the supposition that the cement gives additional strength, led to a series of interesting experiments and tests in the laboratory of the University of Illinois, the principal results of which are given below.

In all the tests a good quality of ordinary fat lime was used, slaked for two days in an earthen jar, adding two parts by weight of water to one of lime, and loss by evaporation compensated for by fresh additions of water to maintain a constant consistency. The cements used were a German Portland and Black Diamond Louisville (Ky.) Rosendale, and the usual tests for soundness showed both cements good. The following results were obtained for fineness:

	Portland,	Rosendale,
Retained on a No. 50 sieve	1 per cent.	15 per cent.
" " " 75 "	7 "	9 "
" " " 100 "	7 "	4 "
Passing a No. 100 sieve85	.72

A fairly sharp sand, thoroughly washed and dried, passing a No. 18 sieve and caught on a No. 30 sieve, was used. The mortar in all cases consisted of two volumes of sand to one of lime-cement paste. The testing machine, accurate to half pounds for light pulls, was so arranged as to give a central pull on the test specimen.

Varying per cents. of cement were added to the lime paste. Ten per cent. cement apparently neither weakened nor strengthened the mortar. The following table shows the cohesive strength at various ages for mortars containing different per cents. of Portland and Rosendale cements.

Mortar containing 60 per cent. Rosendale is little, if

by an addition of 20 per cent. to the lime mortar, and no marked increase in strength is reached until 40 per cent. cement has been used, and a small dose of lime to the cement mortar has the same effect as with the Rosendale.

Tests for adhesive strength to bricks showed, in the case of Rosendale, that 10 to 20 per cent. of lime paste in the cement mortar did not materially affect its ultimate strength, while an addition of more than 20 per cent.

COST, STRENGTH AND EFFICIENCY OF THE SEVERAL MORTARS.

Cementitious material.						Mortar.		
Composition in per cents.		*Cost per cubic yard of mortar.				Strength.		Relative strength cost.
Lime.	Cement.	Lime.	Cement.	Total.	Relative.	Pounds per sq. in.	Relative.	Relative strength cost.
0	100	\$1.00	\$7.46	\$7.46	1.00	85	1.00	1.00
10	90	.10	6.71	6.81	.91	84	.98	1.09
20	80	.20	5.97	6.17	.82	78	.92	1.11
40	60	.40	4.48	4.88	.65	48	.57	.86
60	40	.60	2.98	3.58	.48	35	.41	.85
80	20	.80	1.49	2.29	.31	20	.24	.76
90	10	.90	.75	1.65	.22	14	.16	.74
100	0	1.00	.00	1.00	.13	12	.15	1.05

* Cost of sand not included.

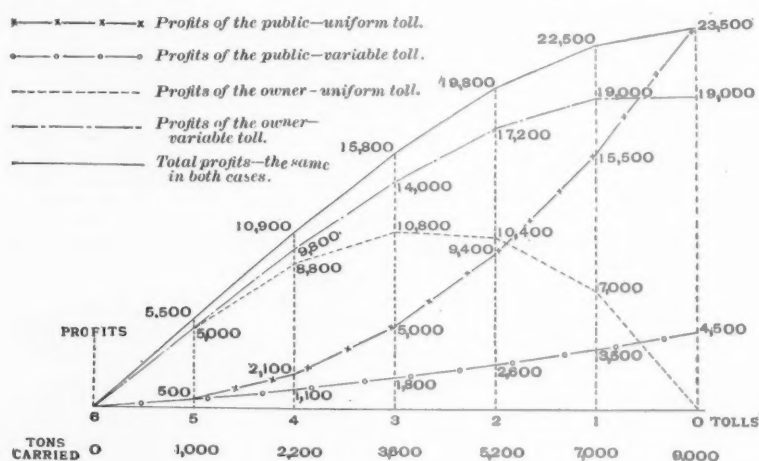
lime paste reduced the strength. This partially sustains Gen. Gillmore's statement. An 80 per cent. lime mortar is weaker than all lime. With Portland cement it was found that from pure cement mortar down to 60 per cent. cement mortar, separation occurred through failure of adhesion, while with higher per cents. of lime results for cohesive strength were obtained. The strength of mortars containing 80, 90 and 100 per cent.

cement were practically the same, from which it would follow that the addition of a little lime to cement mortar does not noticeably decrease its strength, but, on the other hand, an addition of 10 per cent. cement to lime mortar gives no increase of strength. Taking the prices of cement and lime at Chicago, *i. e.*, cement at \$3.25 per bbl. of 400 lbs., or 0.8 cts. per lb., and lime at 60 cts. per bbl. of 200 lbs., or 0.3 cts. per lb., the relative and absolute cost of equal volumes of cementitious material in the various mortars, as indicated by the tests made, will appear from the following table.

The Influence of the Rates of Toll on the Utility of Transportation Routes.

In the following translation of a section of one of the chapters of Colson's remarkable work entitled "Transports et Tarifs," which we have noticed in another column, the reader will bear in mind that by "toll" the author means not the charge for transportation, but the charge for the use of the transportation route, which goes for interest on the cost of the route and for the expenses of its maintenance, substantially the same as our former canal tolls.

From the moment when the amount of a toll can vary within quite extended limits, it becomes important to endeavor to take account of the consequences of its variations. The masterly studies made by M. Dupuit, Inspector-General of Bridges and Highways, have thrown great light on this question, and we shall try to make plain the result at which he has arrived. In order to render the reasoning more clear, we shall make



Influence of Rates of Toll on the Utility of Transportation Routes.

hypotheses, represented by definite figures, both for the tolls levied on the shipments between two given points, *A* and *B*, and for the traffic corresponding to each of these rates of toll.

We shall try to make the results sensible to the eye by a graphical representation. We shall represent the different rates of toll levied on goods going between *A* and *B* by lines of lengths proportional to the amounts of these tolls, by lines set off on a horizontal axis, and the profits realized, under the different hypotheses, by vertical lines. Distinct curves will well indicate, for the case of the uniform toll and for that of the variable toll, the law of the variation of the profits of the public (shippers and consignees) on the one side, and those of the transportation route on the other. In the valuation of the profits of the transportation route, we will assume, for the sake of simplicity, that these profits are represented by the gross receipts, neglecting the influence (relatively small) of the density of traffic on the maintenance expenses. The total utility of the transportation route, under each hypothesis, will amount to the sum of the receipt of those who hold the transportation route, and of the gains which it will procure for the public.

Let us suppose that the sum of six francs represents the upper limit of the excess of the value of the transportation effected over the cost of such transportation. There are no goods which it would pay to ship from *A* to *B* if a toll of six francs had to be paid; this toll would correspond with 0 traffic.

Let us suppose that by reducing the toll to five francs there would be a traffic of 1,000 tons. This means that there exists 1,000 tons of goods—manufactures, for instance—for which the excess of the value of the transportation over its cost is between five and six francs. On paying five francs toll, the public finds still a profit varying for the different shipments from 0 to 1 franc per ton, on the average, say, half a franc, aggregating for 1,000 tons 500 francs. The holder of the route has a receipt of 5,000 francs, and the use of the route procures for him and the shippers and consignees combined an aggregate profit of 5,500 francs.

If the toll is reduced the traffic will increase, and generally, if we consider equal successive reductions each of them will give an increase of traffic greater than the preceding one. This is, in fact, a general economic law, established by observation: when the reduction of

prices renders an object accessible to new purchasers, as this reduction increases, successive reductions, each amounting to the same sum, give a development of consumption so much the greater, as the prices being lower. The successive classes of consumers have been reached. In our example, therefore, in accordance with this law, we will take figures corresponding to a constantly increasing traffic following a series of reductions in the tolls, each of one franc. However, the conclusions of the reasoning would be exactly the same if the law of the development of the traffic were different, provided that it develops in proportion as the rates fall, as necessarily is the case.

Let us suppose that a reduction of 1 franc in the toll gives an increase of 1,200 tons; that proves that there exist 1,200 tons of goods, woollens or cottons, for example, which can pay 4 francs and cannot pay 5. Thus for this merchandise the excess value of the transportation over its cost price is within the limits of 4 and 5. On these 1,200 tons, the public, while paying 4 francs, will realize a profit somewhere between 0 and 1 franc per ton; say half a franc on the average, or 600 francs for the whole. If the toll is fixed uniformly at 4 francs for goods of all kinds, the public will realize further, on the 1,000 tons, which formerly paid 5 francs and which now pay but 4, an additional profit of 1,000 francs, adding these 1,000 francs to the 500 francs, which it was already gaining on these same 1,000 tons at the 5-franc rate, and to the 600 francs gain on the additional shipments, we find that the public, with the uniform toll of 4 francs, draws from the use of the route in question a total profit of 2,100 francs. Those who control the route receive 4

francs per ton for 2,200 tons, or 8,800 francs, and the aggregate benefit for it and the public together is 10,900 francs. The reduction of the rate has been favorable at once to all interests.

Suppose that a further reduction of a franc per ton gives a new addition of 1,400 tons of freight—of wines and oils, for example—which are able to pay 3 francs, but cannot pay 4. By the same reasoning we see that the average profit of half a franc per ton which the public obtains by the added transportation, added first to the profit which it received already from the freight shipped previously at 4 francs, and then to the 1 franc per ton which the carrier has given up on this latter transportation by reducing the toll, brings the public's profit up to 5,000 francs. As to the carrier, or owner of the route, he receives 3 francs \times 3,600 = 10,800 francs. Here again all parties gain, and the aggregate profit of the public and the carrier amounts to 15,800 francs.

Let us apply the same reasoning to a further reduction of one franc, which will attract a new traffic, say of grain, timber, etc., amounting to 1,600 additional tons. The public will continue to gain, on the one hand by the increase in the quantity of the freight which makes use of the route, and on the other by the reduction in the rate applied to the freight which was already using it. A calculation shows that its gain amounts to 9,400 francs. But the carrier receives only two francs multiplied by 5,200, equals 10,400 francs, so that the reduction in the rate, while developing the traffic, begins to make him lose more than he gains. The total utility of the route, on the contrary, continues to increase, and amounts to 19,800 francs.

If we assume that by reducing the toll to the uniform rate of one franc still further additional freight is attracted, for example, coal, stone, etc., the profits of the public will continue to increase. Calling the increase in traffic 1,800 tons, we shall see that the public would gain 15,500 francs in all, but the carrier would receive only a franc per ton for 7,000 tons, and consequently would suffer a considerable loss.

If, finally, in order to attract 2,000 tons of freight of very low value, which cannot even bear a rate of one franc per ton, such as poor ores or agricultural fertilizers, the toll should be abolished entirely, the carrier's receipt would be reduced to zero. As to the public, it would gain one franc per ton on the freight previously carried at that rate, and besides half a franc a ton on

the new 2,000 tons, that being assumed to be the average amount of the value of the transportation above its cost; its profit reaches 23,500 francs in all. The total utility of the transportation route, which now consists of this sole element, since no toll is paid, reaches notwithstanding this, the maximum amount.

It results from this that if the toll is uniform the interest of the carrier, up to a certain point, agrees with that of the public to favor a reduction of the toll. But this agreement ceases when the reduction has been carried to the figure which corresponds with the maximum receipts of the carrier. Beyond this point, every new reduction is favorable to the general interest, since it reverses the services rendered by the transportation route; but it constitutes, on the part of the toll receivers, a sacrifice without compensation. Finally, to obtain the maximum of useful effect, the toll must be suppressed entirely, which makes it possible to effect all transportation, which is worth more than its costs, but by depriving of all remuneration the capital invested in the route.

Let us suppose now that it is possible to establish different rates of toll; that while continuing to charge five francs on manufactured goods, only four francs is charged on cottons and woollens, three francs on wines and oil, two francs on grain, one franc on stone and coal, and that, finally, lean ores and fertilizers pay no toll at all. Each kind of freight having to pay only the rate which it can bear, none will be excluded, and it will be the interest of the public to ship the whole of the freight which it would ship on the hypothesis of a uniform rate of toll, only if this rate were reduced to zero.

What will be the benefit realized by the public on one side and by the owner of the route on the other? Let us imagine this series of diminishing rates created successively: Five francs, four francs, three francs, etc. When, for example, the first three rates have been established, there will be transported in all 3,600 tons of freight. For each of these tons the excess of the value of its transportation over its cost is included between the rate established in its favor, a rate which has rendered the transportation possible, and the rate higher by one franc, at which, by our hypothesis, the transportation was impossible. The benefit of the public, for each ton comprised between 0 and 1 franc, is an average of half a franc per ton carried. The advantages which it draws from the transportation route go on increasing in proportion as new reduced rates are created; but they increase less rapidly than in the previous example, since they are never more than half a franc multiplied by the total tonnage. As to the carrier, his profit increases likewise continuously, since by establishing the four-franc rate for cottons and woollens he adds to the 5,000 francs which he was already collecting from manufactured goods paying 5 francs; 4 francs \times 1,200 = 4,800 francs, charged on the new traffic carried. The establishment of the 3-franc rate, without implying any sacrifice on the traffic secured by the 5-franc and 4-franc rates, adds 1,400 \times 3 francs = 4,200 francs more to the receipts, and so on. The interest of the proprietor of the route harmonizes with that of the public in urging him to make new rates more and more reduced, which will make possible the transportation of new freights. Even the entire abolition of tolls for the lowest class of freights, if it does not make any return to the owner of the route, is at least not burdensome to him, since it attracts traffic which cannot bear any toll, without implying the abandonment of any part of that which does pay.

If, as before, we seek for a measure of the total utility of the transportation route after the establishment of each new reduced rate, by adding the profits of the public to the receipts of the proprietor of the route, we find exactly the same figures as marked the hypothesis of the uniform rate of toll. With the three rates of 5, 4 and 3 francs, for example, the total profit is 15,800 francs, exactly as with the uniform rate of 3 francs. It is easy to understand that the total utility of the road shall be exactly the same in the two cases, since it serves for the same transportation. But the division of the profit is very different. While in the first case the proprietor of the route gained 10,800 francs and the public 5,000, here the public gains only 1,800 and the proprietor of the route 14,000. The only difference between the two policies is, that with the uniform toll the owner of the route cannot attract any new traffic without abandoning to the public a part of what he receives on the traffic already acquired, while with the variable rates of toll he can keep the whole of it.

Thus the analysis of the facts shows that if excessive tolls prevent a transportation route from rendering all the services which it is capable of rendering, it is not by reason of the high rates on the traffic which actually is carried, but because of the obstacle which the toll puts in the way of the transportation of a certain amount of traffic whose value would exceed its cost, and which, therefore, would be able to yield some profit. So long as no higher rate than it can bear is charged for the transportation of any given merchandise, the modifications of the rates charged on such merchandise modify only the division between the public and the owner of the route of the advantage secured by this transportation, without affecting the total advantage of it. But when an excessive rate renders impossible a transportation which would be useful, there is then a clear loss for everybody—a diminution of the service rendered by the existing route, without advantage to any one.

It follows from this that every obstacle placed in the

way of a reduction of a rate necessary to permit the creation of a traffic which without such reduction would not exist, is in itself an evil, an absolute evil without compensation, if we view exclusively the question of transportation, for there may be motives of international policy; for example, which lead a government to interpose an obstacle, through rates, to transportation which would be economically useful. On the contrary, the measures which favor or hinder the reduction on the advance of rates, within the limits in which these

to pay, or to make possible a transportation whose value is less than its cost.

The considerations which we have just developed on the supposition of a private enterprise to which a transportation route has been conceded, apply precisely to routes belonging to the state. It can even be said that in the case of state railroads it would be most legitimate to continue to make every traffic, pay all that it can afford to pay, even if the receipts should greatly exceed the expenditures, since in this case the profits would not

hydraulic pressure and bolted or riveted to place. The bolts when used are riveted over on the outside of the nuts. The flange on the centre, against which the tire bears, is intended to relieve the flange on the tire from lateral thrust.

The bolt holes in the tire flange are drilled $\frac{1}{8}$ of an inch larger than the body of the bolt to give clearance and allow for the compression of the rubber cushion. The bolts all fit tight in the holes in the wheel centre. The tire is slightly tapered to assist in removing it when necessary for repairs.

It is claimed for this wheel that, owing to the elastic cushion, the wheel makes less noise, and vibrations resulting from uneven track and other causes are absorbed. Further, it is claimed that the rails are relieved of much of the stress resulting from unbalanced or flat wheels. Also that the vibrations are absorbed in the cushion to an extent which reduces the tendency of the axles to crystallize.

This wheel has been used considerably in street-car service, and is now being thoroughly tried on the Indianapolis, Decatur & Western Railroad. The offices of the Cushion Car Wheel Company are at Indianapolis, Indiana.

Cattle Guards—The Principles of their Design and Construction.

The principles involved in the construction of the surface cattle guard are quite universally admitted to be correct, and the very general adoption of existing forms shows that in practical experience they have fulfilled many of the expectations of which the early experimental tests gave promise. Their growth into general favor has been hardly ever equalled for rapidity in the history of any device used in track. The adoption of track devices is ordinarily a very slow process, requiring elaborate trials under varying conditions of service.

In the strict sense of the term, the cattle guard is a part of the railroad fence, and not of the track, and its position in the roadway is only incidental to the proper fencing of the line. Manifestly, then, the ideal cattle guard is one which while affording the protection of a perfect fence shall introduce no features tending to impair the safety of the track, or to lower the standard of condition of track as made apparent in the smooth riding of passing trains. That the merits of the surface guard should have been so promptly recognized, is proof positive that in its general features, it is superior to the different modifications and forms of pit guards which preceded it. The reason for this prompt and general recognition of the worth and utility of the surface guard is not difficult to discover. The pit guard compelled an opening in the road-bed, which destroyed the continuity of the track, and required the closest attention from the track men to prevent the violent jolts, and unpleasant oscillations to passing trains, which so frequently denote the crossing of an ordinary highway. In this regard, the pit violates the chief requirement of the ideal guard, viz.: That its application shall in no way impair the riding qualities of the track. This objection is entirely corrected by the use of the surface guard, as its application necessitates neither a change of or disturbance to either track or road-bed.

In the matter of safety, the pit guard is no less vulnerable, it being practically an open culvert, attended with all the objections which attach to that form of structure.

rates do not interpose an obstacle to the traffic, have no influence on the creation of wealth, and react only on its distribution between the proprietor of the route and those who use it.

Does it follow that these measures are matters of indifference to the general interest? The holders of transportation routes like to claim this, and pretend that from the moment when they do not prevent any useful traffic, nothing justifies measures which interpose an obstacle to their drawing from their enterprise all the receipts it can give them. Doubtless it is just to let them find a sufficient remuneration in their enterprise. They have risked their capital, since before making the experiment it could not be known if the sources of traffic would be sufficient to enable them to extract from the enterprise the interest on the money sunk in the works. It is just that, if the enterprise is well planned and well managed, it should yield large profits. It is not to be forgotten, however, that these profits result from a monopoly conferred by the public authorities. [In France.] The government, which might call on new companies to share this monopoly, by creating lines parallel to the lines which are already prosperous, commits no injustice when it uses the means at its command to compel the companies which hold the old lines to abandon to the public a part of the profits which they realize when these profits are very large. This limitation of their profits is the more just, as the risks run have been less. A company which enjoys a guarantee of interest has evidently less foundation in equity to claim the free disposition of the excess of its receipts than one which has incurred all the risks of its enterprise. It is intelligible, therefore, that it may be compelled to share this excess with the state, either by devoting it to the establishment of new lines, or by making reductions in rates which are not required by the conditions of the traffic.

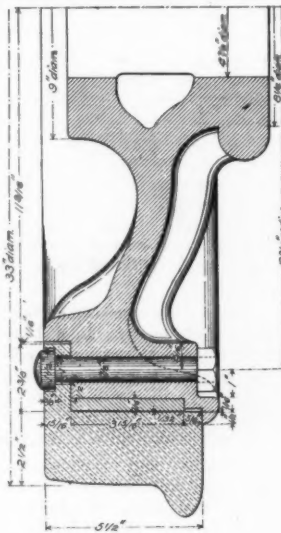
This is why in many countries the contracts in railroad charters stipulate for a division of the profits and reduction of the rates when the dividends paid the shareholders shall exceed a fixed figure, as 8, 10 or 15 per cent. We have seen how in France the excess of receipts of the first lines constructed has been applied especially to the extension of the railroad system.

When, on the contrary, a company has difficulty in finding in the traffic of its lines the receipts necessary to cover its charges, equity demands that it should not be refused the means of drawing from its enterprise the interest on its investment; or, in other words, it should be allowed to vary its rates in such a way as to make each kind of freight pay all that it can bear, provided that it does not prevent any transportation—and its own interest is not to prevent any—it does not prejudice the public interests. If a guarantee of interest preserves the shareholders from the consequences of insufficient receipts, obstacles to increasing the earnings interposed by the state have no longer the same character of injustice with regard to the company; but the injustice is toward the taxpayers, whose burdens are increased by the action of the guarantee of interest, solely for the purpose of enabling those who use the lines to pay less than it is worth for their transportation. This is said with reserve of the cases where the indirect advantages of transportation at very low rates would compensate for the sacrifices imposed on the taxpayers; but these cases are less frequent than is generally believed, and the circumstances must be very peculiar to cause it to be for the public interest to exempt a certain traffic from the payment of a rate of transportation which it is able

enrich certain individuals, but would make it possible to lighten the public charges. From the moment when an intelligent system of rates would not prevent any useful traffic, would it not be rational for the state to make every one to whom it renders a service by transporting something for him, pay the whole value of that service rather than burden commerce and industry with heavy imposts? In Germany and elsewhere where the railroads have been acquired by the states, it is common to contrast rates governed by the public interest with rates governed by private interests. But it is too often forgotten to explain in what the one differs from the other. An attentive analysis shows that in the majority of cases the only system of rates opposed to the public interest is that which, under pretext of uniformity, prevents certain useful transportation. Thus on a line skillfully managed, the search for the most profitable rate is in no way an obstacle to prevent that line from rendering to the public all the services which it can expect from it, and the true public interest is, not that there be no surplus receipts, but that a good financial system apply this surplus in accordance with the public interest.

The Cushion Car Wheel.

One of the recent novel car wheels is shown by the accompanying cuts. It is called the cushion car wheel because there is a rubber cushion between the tire and the wheel centre. The centres are made either spoke or



Spoke Wheel for Engine Trucks.

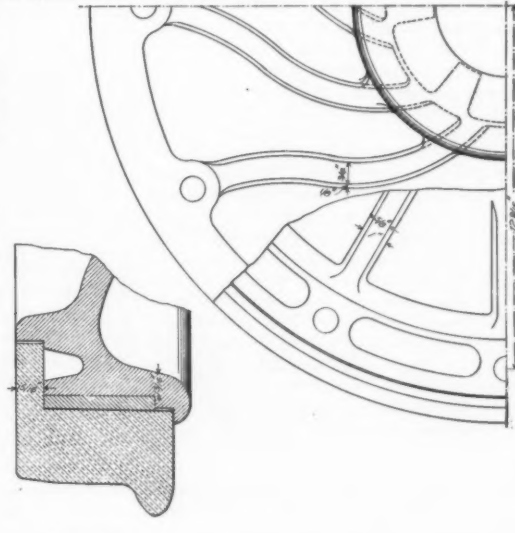


Plate Wheel.

THE CUSHION CAR WHEEL.

plate, as shown, and of cast iron or of cast steel. The tires are secured by through bolts which are counter-bored in a flange on the outside of the tire, the nut being recessed into the rim on the inside. There is a flange on the inside of the rim against which the tire bears. In placing the tires on the wheels a steel band, $\frac{1}{32}$ of an inch thick, is put on, outside of the rubber. The tire is then forced on over the steel band by

In recent years much money has been expended, and attention paid to the perfection of the floors of bridges, so as to admit of the safe passage of derailed cars or engines, with no greater danger than would be experienced under like circumstances on an ordinary road-bed. To accomplish this, various forms of guard rails and timbers have been applied to keep the wheels upon the ties, while the latter have been so placed and adjusted as to

permit the unimpeded movement of the wheels of cars or engines so derailed upon the surface of the ties, without injury to either trains or bridges. In many cases at great expense the bridges have been constructed to carry ballast, and thus secure an unbroken and continuous road bed. In the aggregate, very large sums have been expended in closing up small openings, by the substitution of iron or clay pipes, stone box and arch culverts, to replace the open structures of wood which were originally built. In this respect the pit cattle guard is in direct violation of approved practice, for its only purpose being to turn stock, the pit must be left open, or if a slat or tie covering is used, it must be formed and adjusted to prevent a foothold to animals attempting to cross. The bridge floor, to meet the fullest requirements of safety, needs a form of construction that will permit the safe passage of derailed trains, but this form of construction affords safe and ample footing for any class of stock. For a perfect fence, a cattle guard must be so designed as to be impassable to stock. Thus with pit-guards we are placed in this awkward dilemma, if we perfect the deck of the guard to turn stock, we depart from good practice in the construction of safe bridge floors. While if we aim to secure a deck which affords safety, as applied to bridge openings, we make the pit useless as a fencing device to prevent the passage of stock.

Few, if any, of the prevailing types of cattle guards afford the protection which so important a matter demands, and when once familiar to the cattle they cross and recross with comparative ease and safety. In one case known to the writer, some eight or ten years ago, in the western part of Indiana, a horse ran in advance of a freight train a distance of nearly four miles over cattle guards, culverts and bridges, and that without injury. While the surface guards afford all that can be desired in the way of conformation to modern and approved bridge practice, yet they fail to afford that complete protection against intruding stock which a cattle guard is intended to afford. In this respect the iron guards have failed to meet some conditions, and even when strips have been alternated in height, and the guards suspended so as to give a vibratory motion to the guard, they have failed to turn bush cattle and incorrigible stock. The mistake has arisen from the attempt to depend upon the appearance of the guard, or the mere discomfort of stepping on it, for these features soon become familiar to stock, and they no longer serve to deter. What is required is a guard which will pain and at the same time not permanently injure the animal attempting to cross it. Where punishment is inflicted every time the passage of the guard is attempted, the animal grows more and more shy, and the guard becomes daily more effective and deterrent.

A Traveling Jib Crane.

One of the problems in the construction of the immense iron and steel buildings, now so frequently erected, is that of raising members, weighing all the way to two or three tons from the ground to the various levels. The old method of lifting by a derrick and guy ropes and taking the power from engines below, although still used, is quite expensive, and the signaling by whistles or bells is very uncertain and at times unsafe. Also the extra handling necessitates a large number of men, which latter point is of growing importance, as on a 20-story building the number of men engaged constitutes quite an army at best.

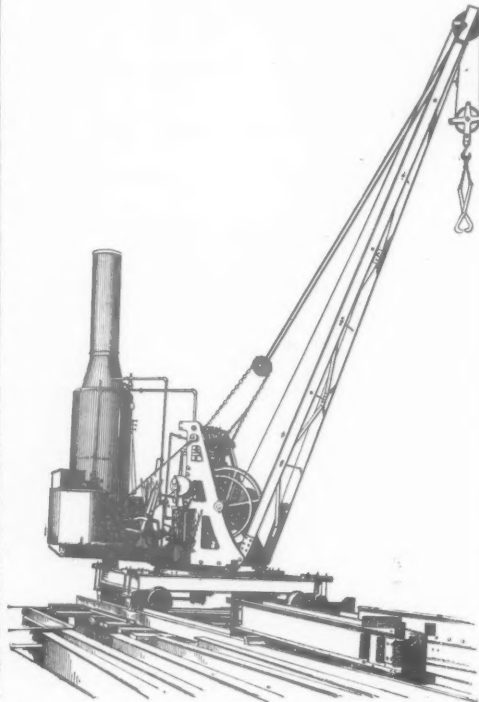
The illustration of the jib crane, which we give below, is from a photograph of one designed by Mr. McCain, who has taken contracts for the erection of a number of the tall buildings in Chicago and who made this machine to meet the requirements on such work. This crane was built by the Vulcan Iron Works, Chicago, and it is pronounced by those using it to be a decided improvement in labor saving and especially in the matter of time over the apparatus heretofore in service.

The platform on which the crane revolves is of cast iron, bound about with 10 in., wrought iron I beams, riveted in. The whole is carried by outside truck wheels, the journal bearings being bolted up to the flanges of the beams. The mast is bolted to the lower bed by six 1½-in. bolts, and to the side frame are fastened the cylinders, shafts and drum. The engine is duplex, having cylinders 6 × 8 ins. and is supplied with steam from a 38 × 96 in. upright boiler, at a pressure of from 70 to 80 lbs. The coal box is attached to one side of the boiler and will hold about half a ton of coal (anthracite). This is balanced by the water tank on the opposite side, which is built for about four barrels capacity. The boom is made up of two 7-in. channels, tied together with small rods and cross braced with flat iron and is hinged at the lower end on a 2-in. pin.

The main engine shaft drives the large 52 in. gear direct by means of a small pinion, the gear being fastened to the 20-in. drum, around which the ¾-in. cable is wound. For ordinary lighter work this cable is fastened direct to the tongs instead of being passed over the sheave block and back to the top of the boom. The engine reverse lever works with a link connection, all other levers controlling friction clutches. The drum is supplied with a prony brake at one end, and may be held completely under the direction of the operator. All

the gears are of cast steel with the exception of the 52-in. gear. The swing motion is transmitted through the mast to a pinion below the bed plate, and by means of an intermediate gear to the inside rack on the bed. The raising and lowering of the boom by the block and chain is done by a worm attachment, and increases the range of the crane very materially, as well as allowing for the raising of much heavier weights (about 3½ tons). When the boom is straight out the balancing or lifting power of the crane is about two tons. This is, of course, without holding down the frame with clutches.

The whole apparatus is handled by one man. The operator, standing on the back of the platform, may by the use of his levers raise or lower the boom, hoist or lower the tongs, revolve the crane about its axis, or move the crane with its load forward or back, and by the use of the throttle handle, just above the levers, he may regulate the speed as he chooses. In order to shift the crane sideways it is necessary to first tip the platform up by catching hold of some fixed object with the tongs and then sliding a rail under the smaller roller wheels, which, it will be noticed, are a little above the level of the main rollers. The larger wheels run on a 7-ft. gauge platform track laid close to the edge of the



A Traveling Jib Crane.

structure, or across, as may be desired. In working the crane the first manner of laying the track may be utilized for a considerable saving in time.

The posts or girders to be lifted are usually piled together on the ground in front or at the side of the building, and the crane on beginning to hoist is at the same time moved along the edge to the point where the post is to be set and the speeds so regulated that the crane will have moved over to the other end of the building by the time the post is raised to the required level. This mode of procedure may be followed with a large number of the pieces in the construction of office buildings and is a source of much gain in time. The speed with which this may be operated may be illustrated by the fact that two upper stories of a building standing on 165 ft. × 100 ft. of ground, were erected in one week, the men working 10 hours a day. This building stands 168 ft. above the pavement.

In the erection of such a structure the placing of posts and girders is done entirely by five men, two on the ground for fastening the tongs to the piece and steadying it with a guy line, one at the crane and two at the top to place the piece in position and secure it with a bolt at either end. These two top men are followed closely by the riveters who finish the construction.

The tongs used for handling the material, as at first made, had a block facing of wood at the lower end, but this was discarded for a rectangular wrought iron piece covered with cloth for one finger, the other finger being drawn to a sharp point. This latter works well, with no slip, and has given no trouble. Such a machine as this will be appreciated on account of the ease with which it may be handled and its quick action, and having so many movements, all worked by the one small duplex engine. The details are simple, and the weight and strength have been carefully considered, the position of the boiler being such as to allow for a considerable lifting capacity. The total weight of the crane is about 10 tons. Not the least handy feature about this crane is the fact that it mounts from story to story up an incline by a hitch around its own spool and driven by its own power.

Burlington Freight-house at St. Louis.

Since the erection of the new bridge across the river at St. Louis there has been considerable activity on the part of several of the lines entering the city from the east and west in increasing the accommodation in the yards and freight-houses. The old bridge confined all operations in this line to a very limited area, as all trains were obliged to go through the tunnel. The new approach to the heart of the city from the north allows a much wider range for the selection of suitable locations for receiving, delivering and transfers.

The St. Louis, Keokuk & Northwestern is building an extensive freight station a few blocks north of the Eads bridge on the west side of Main street. This station is a large one, and being in the midst of the business portion of town, will, when completed, give the Burlington excellent facilities for handling its traffic, its arrangements, like those of several others, having been heretofore quite inadequate for the needs of the traffic.

The south end of the building is to be so constructed as to give ample office quarters. These are to be 38 × 141 ft. and five stories in height, with a severely plain front, with brick walls, and facing on the side street. On account of the incline along the front of the office, it is necessary to build heavy retaining walls around three sides, as the basement is to be used for storage. The main floor is made up of 32-in. girders 35 ft. 8 in. long, laid 9 ft. 6¼ in. centres, and arched in with brick or hollow tile. These girders are built up of ½-in. web, with 5 in. × 5 in. × ½ in. angles top and bottom, and will form a very stiff, solid floor. The lower basement floor is to be laid with concrete.

The main train shed is 760 ft. long and 131 ft. wide and spanned by an iron trussed roof, the main centre panels being mostly 60-ft. centres. The north truss has a latticed bottom chord to brace it against wind pressure on that end of the building. These main trusses reach across the five tracks only and rest on heavy composite Z columns bolted down to concrete foundations running down to rock bottom. These foundations are brought up to the platform level and have bolts extending down into them 14 ft. The bolts are made U shape, of 30-ft. rods, and sustain two pieces of rails of about 8 ft. in length on the lower part of the U. The rails are connected near their ends by short rods passing through holes drilled in the webs. It would seem that such a precaution as this against the disturbance of the holding bolts should be more than sufficient to guard against any possible pull from the upper end.

To the main posts at some 8 ft. below the eaves of the centre span is built a shed roof on either side, running down to a row of smaller posts built of Z iron and plates, placed 20-ft. centres, and between which the doors are hung. Each 20-ft. panel contains a door (the full width of the panel) balanced on weights, which are suspended in the hollow of the Z posts. Over the doors are large windows, so that when the door is down light may enter above, but on raising the door it shuts this off. Allowance is also made for light and air between the main and side roofs by having alternate frames set with slat ventilators and glass.

The five tracks extending the entire length of the shed are built on terraces on an average slope of 1 in 20 to conform to the grade of the street at the north end, and are laid 11 ft. centres, it being the intention to load the three intermediate lines of cars through those on the tracks next the platforms. Beyond the north end of the shed, the platforms extend for 87 ft. out, and have each an 11-ft. building at the inner end, and are also provided each with a 15-ton boom crane having a 15-ft. swing. These will be used for transferring all heavy material, and will be of great assistance in the saving of time and labor on ordinary methods of loading. The need of such better facilities is being felt more and more by the carriers, and there is the additional advantage of locating the appliances at the general freight-house, in that frequently it may be better to unload part of the car by power, and at the same time it would not pay to switch that portion of the load to another part of the yard in order to reach the crane.

Inside the shed the platforms are furnished with Fairbanks scales of six tons capacity each, there being 22 in all, 18 on the west or receiving platform, and four on the east or delivery side. Both platforms throughout are built on the 1 to 20 slope, the receiving one being on the high side. When completed it will be possible to throw open the whole of the house with the exception of one 20-ft. panel on each side, so that every foot of floor surface may be utilized to the best advantage. The end, across the tracks, is supplied with a large lattice work gate nicely balanced by weights in pockets at the sides.

In putting in the foundations for the piers considerable difficulty was experienced at times in finding a good rock bottom. In some cases the rock suddenly fell off perpendicularly in ledges to quite a depth, and also heavy crevasses occurred filled in with clay. In these latter cases it was decided to lay a bed of concrete across the split in the rock and allow it to set, thus forming an arch between the opposite walls, which would prove as stable and firm as could be desired. By building the piers of large concrete blocks and the main and outer walls of rubble, with hard brick above the ground level, and by laying the bottom courses very deep, this plan has resulted in making a substantial structure.

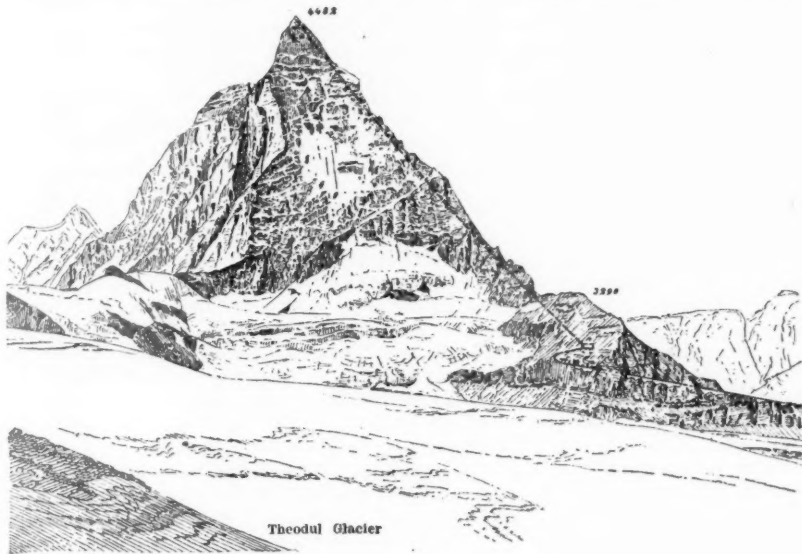
The work was designed by Mr. G. S. Morison, and is being supervised by his assistant, Mr. Crosby.

The Proposed Railroad to the Peak of Matterhorn.

A very bold engineering project by a Swiss Engineer, Mr. X. Imfeld, is described in a recent number of the *Schweizerische Bauzeitung*. The following is an abstract of that description.

Zermatt, in the Pennine Alps, has been for a long time the headquarters of high mountain climbers, but has naturally been difficult of access. Recently the Visp-Zermatt railroad has been completed, which will result in an increased popularity for this village. It is proposed to extend this new railroad two and a half miles up the valley to Gorge, and from this point construct two high

not thought to be greater than those to be met in the Jungfrau road. The surface will be followed as closely as feasible. Steps and niches along the road are to be made, and a landing place is to be constructed at the half-way point. Safety appliances will be carefully worked out, such as the increasing of the flexibility of the rope by using several small ones, rather than one large one. The brakes will, of course, be of the best, and means for signalling and controlling the velocity will be carefully worked out. The road will emerge to the light of day about 60 ft. below the almost horizontal peak of Matterhorn. Here cabins, restaurants and quarters for



The Proposed Matterhorn Railroad.

mountain railroads, one to Gornergrat and the other to the peak of Matterhorn.

The motive power and superstructure of these roads will be designed to conform to the slopes of the mountain sides.

The Gornergrat Branch is to consist of two sections—an electric cable road and an electric rack road. A short connecting piece of nearly level adhesion road extends from Gorge across the river Visp to Moos, the starting point of the mountain road proper.

The first section extends from Moos to Riffelalp; has a horizontal length of 4,280 ft., a difference in elevation of 2,100 ft., an average grade of 48 per cent., a maximum grade of 55 per cent., a minimum radius of 980 ft., and a gauge of 2.62 ft. The superstructure will consist of the Abt rack, and the motive power is to be supplied by an electric plant at the middle point of the section, where the cars are to meet at a platform there provided. The estimated cost of this section is set at \$130,000.

The second section, extending from Riffelalp to Gornergrat, is to be an electric rack road with the following dimensions: Horizontal length, 13,940 ft.; difference in elevation, 2,660 ft.; average grade, 19 per cent.; maximum grade of 23 per cent.; gauge, 2.62 ft.

The superstructure will consist of the Abt rack, and the motive power will be furnished by electric locomotives of special and novel design. This section is estimated to cost \$247,400.

The Matterhorn Branch is to consist of three sections, viz.: an electric cable road, an electric rack road and an electric wire rope road.

From Gorge to Zum See is a piece of Abt rack road connecting the adhesion road with the Matterhorn Mountain road proper. The length of this connecting piece is 2,950 ft., the average grade 1.28 per cent., and the minimum radius of 230 ft.

The first section extends from Zum See to Scharfburg. It is to be an electric cable road, with the following description: Horizontal length, 3,740 ft.; difference in elevation, 1,760 ft.; average grade, 48 per cent.; maximum grade, 55 per cent.; minimum radius, 980 ft.; gauge, 2.62 ft. The construction will be similar to that of the first section of the Gornergrat branch. The estimated cost of this section is \$110,000.

The second section is from Scharfburg to Whymper-shutte, and is to be an electric rack road of the following dimensions: Horizontal length, 14,900 ft.; difference in elevation, 2,700 ft.; minimum radius, 980 ft.; average grade, 18 per cent.; gauge, 2.62 ft. From Scharfburg the location is along the southeasterly slope of the mountain to Schwarzsee, from whence the line passes through several short tunnels, and finally through one about 650 ft. long, at the end of which is located the subterranean station, Whymper-shutte. The superstructure and motive power are to be the same as for the second section of the Gornergrat branch. The cost is set at \$318,000.

The third section is to extend from Whymper-shutte to the peak of Matterhorn, and is to be an electric cable road. The dimensions are: Horizontal length, 5,830 ft.; difference in elevation, 4,400 ft.; average grade, 75.5 per cent.; gauge, 2.62 ft. The construction is more in the nature of a shaft than a tunnel. The line is in a vertical plane, and has a slight sag. The difficulties, although great, are

On plotting on a diagram the rectangular co-ordinates of which are A and C , the values of C in the above equation, as deduced from data obtained from observations on the Hudson, Delaware, Elbe, Clyde, Raritan, Savannah and St. John's Rivers, he finds that an equilateral hyperbola introduced on the diagram corresponds very closely with the various points of no change of range, and that the points showing decrease of range are located outside, and those showing increase of range are shown inside the hyperbola. By applying to the problem the general equation of an equilateral hyperbola referred to its asymptotes, a general expression is obtained for the value of A in terms of R and S ; that is to say, for the cross sectional area required for propagation of the tidal wave with undiminished range, at any point on the stream at which the tidal range and the area of the tidal basin above that point are known.

The value of such information as this for the engineer in charge of the improvement of tidal rivers cannot be over-estimated, and it is to be hoped that fuller data will confirm the correctness of the method proposed by Mr. Gieseler. His deductions are drawn from a comparison of only nine different observations on different streams, and while his theory appears to be correct, it is not impossible that more extended and complete data would materially affect the form of the curve. Further data are also required for determining the curves of increase and decrease of tidal range as affected by changes in the cross-sectional area, and it is to be hoped that Mr. Gieseler will continue his observations so as to determine the mathematical expressions for all cases.

A Westinghouse-Edison Plant.

In the power plant of the Federal Street & Pleasant Valley Electric Street Railway Co., Allegheny, Pa., the old system of centralized power and accompanying complication of shafting, counter-shafting, clutches, belting, etc., is gradually being replaced by a combination of Edison dynamos and Westinghouse engines. The Westinghouse engine in use is an 18" and 30" by 18" compound. As originally devised a single 225-Watt Edison dynamo was belted direct from the engine, but a second dynamo has since been connected and the whole plant is in successful operation with but a slight increase of steam pressures within the engines. The governor attached to the engine has been successfully experimented with in the matter of quick action in hasty changes of load. The adaptation of such divided power and small engines to the operation of electric plants both large and small, is now being recognized as the most reliable safeguard against large damages and accidents. Small high speed engines of first class make and operation are now in general demand for this power subdivision.

The Glasgow Harbor Tunnel.

The Glasgow Harbor tunnel, on which work was begun in May, 1890, will connect the districts lying on opposite sides of the harbor, and will relieve the pressure of travel over Glasgow bridge and Stobcross ferry, which are now the only means of communication between the two districts. There will be three separate tunnels lying side by side under the harbor bed at a depth of 35 ft. below low water and about 800 ft. long. The tunnels will terminate at each shore in a vertical shaft 80 ft. in diameter, in which will be operated a number of lifts of varying capacity for the accommodation of different sizes of vehicles. The outer tunnels being for the use of vehicles will be level from end to end, while the middle tunnel, which is exclusively for the use of pedestrians, will have

The Range of Tides in Estuaries.

Mr. E. A. Gieseler, Assistant Engineer in the United States Engineer office at Savannah, Ga., contributes to the August number of the *Journal of the Franklin Institute*, an interesting and suggestive paper on a method of determining the range of tides in a tidal river or estuary above any point on the stream at which the cross sectional area of the water at high tides is known.

The advantage of being able to determine the range of the tide above any point at which improvements or changes in the channel of a tidal estuary are to be made is so manifest as not to need any discussion. As Mr. Gieseler well says: "In many cases the improvement of the river proper, and the maintenance of the entrance are in a measure antagonistic to each other. The employment of the means best adapted to achieve the former



THE PROPOSED MATTERHORN RAILROAD.

is apt to be followed by consequences detrimental to the latter."

The elements which he takes into consideration in discussing the question of maintaining a uniform range of tide in long reaches of river are:

A = The high water cross sectional area in square feet at any point;

R = The mean tidal range in feet at the same point; and,

S = The superficial area of the tidal basin above such point expressed in millions of square feet.

He proposes the general formula $C = \frac{A}{RS}$.

approaches inclined at a grade of one in three, the floor of the approach being formed in easy steps. The terminal shafts are lined with cast iron rings in sections, the lower ring being furnished with a cutting edge. As the excavation proceeds the lining sinks of its own weight and rings are added above as required. The tunnels will be lined with cast iron where they go under water, and will be of 21 ft. diameter. The land ends, which are driven through boulder clay, will be lined with five courses of brick in cement resting on a base of cement concrete, giving an inside diameter of 18 ft. Messrs. Simpson & Wilson, Glasgow, are the engineers in charge, and Messrs. Hugh Kennedy & Sons, Patrick, are the contractors. The two shafts are practically completed, and work is well started on the tunnels. It is expected that the work will be finished in 1892. The cost is estimated at less than a million of dollars.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The crop reports continue to be most favorable, and the damage to wheat from frosts, which was reported from the Northwest a few days ago, is now said to have been very slight. In the meantime the wheat exports have been, and continue to be, enormous. The *Financial Chronicle* gives the value of wheat and flour exported in July of this year as \$13,873,000 against \$7,300,000 in July, 1890, and \$6,692,000 in July, 1889. In August the gains in wheat exported were even greater. For the four weeks ending Aug. 29 we find that the seven Atlantic ports exported 17,197,000 bushels of wheat and 769,000 barrels of flour against 3,365,000 bushels of wheat and 666,000 barrels of flour in 1890. The price of wheat still continues high, although it has dropped a little from the maximum reached a week or two ago. Mr. Wm. Bear writes to *Bradstreet's*, under the date of Aug. 10, saying that the shortage of wheat and rye in Europe will be greater than he had before estimated, and if he had to-day to make figures of the net European deficiency of wheat they would be greater than those he made three weeks before. Crops have been injured by storms, wet weather and mildew. The rye crop is shorter than has been supposed, and the potato crop will also be short. On the other hand, the increased price of wheat will result in more Indian corn and barley being used as food. So, altogether, there seems to be ground for the sanguine view taken by men in all branches of business—in commerce, in manufactures and in transportation, as well as speculators. The railroads are busy, and many of them report a scarcity of cars. Earnings, gross and net, continue to improve. Nevertheless, we do not see that the locomotive builders, car builders and makers of machine tools begin yet to realize much from the improved outlook. Those shops are still generally running very light, although everybody is talking about a speedy improvement in the situation.

Rumors have constituted the principal staple of railroad news in Wall street the past week. The arrangement for taking up the twenty millions of unfunded debt which is now pressing the Union Pacific is still a subject of discussion, the requisite amount not having been subscribed. The straitened position of the road gives occasion for a great variety of stories, and one of these which has been repeated with great persistency is to the effect that the Vanderbilts have practically secured control of the road. The only tangible basis for this is the fact that J. Pierpont Morgan, who is at the head of the committee for extending the Union Pacific notes, has intimate relations with the Vanderbilts. The conjecture that prominent capitalists in the Chicago, Milwaukee & St. Paul and the Chicago, Rock Island & Pacific have secured enough of the obligations of the Union Pacific to demand and receive of the latter a friendly agreement for interchange of business, comes the nearest to a rational explanation of the origin of these rumors that we have seen. The Ohio & Mississippi has furnished a secondary topic, there being "a general impression" at Chicago and other fountain heads of railroad news that it will soon come under the control of the Vanderbilts. The fact that President Barnard, of the Ohio & Mississippi, and President Ingalls, of the "Big Four," have just sailed for home

from England on the same steamer, seems to be regarded as the most important evidence to sustain this report, though it is not stated whether or not they will eat at the same table during the voyage.

The train accident at Statesville, N. C., last week is, like the rear collision on the West Shore at Montezuma, N. Y., Aug. 6, where 16 persons were killed by the sheer recklessness of a freight conductor in not keeping clear of the passenger train behind him, a disaster concerning which words seem to be of no avail. To prevent such cases as Montezuma, the railroad company must either adopt the block system or see that every freight conductor is a man of reliable mental and moral character. The first named is the radical remedy for rear collisions and the one widely tested by experience; and yet the other must be admitted to have points in its favor when roads which have successfully conducted a large business for many years without a block system stoutly aver that the relatively high personal character of their trainmen is to be credited with a large share of the freedom from rear collisions which helps to make the good reputation of the road. It looks as though both remedies had been neglected in this case, and yet every operating officer must know how grave is the necessity for reform at this point. As far as we can gather from present advices, the Statesville disaster was the deliberate work of train wreckers. To stop, or even abate, this species of devilry—for it is now so common that the Associated Press reports cases almost every day—there must be a general and decided improvement in the police administration in cities and towns all over the country. The need of this improvement is everywhere well understood, for the dangers that beset the railroads are co-extensive with the tramp nuisance that is familiar to every citizen; and so we say, as above intimated, that the need is for action and not for preaching. Some may hold that the community is responsible, rather than the railroads, for accidents resulting from conductors' or engineers' wrong-doing, because plain cases of criminal negligence on the part of these classes are not more severely punished by the courts. It is true that prosecuting officers have in many cases shown a decided lack of energy, but in view of the success with which they generally throw upon the railroad company much of the blame for their inaction, we are not disposed to saddle upon them any questionable responsibilities. They will do well if they can lessen the number of crimes like that at Statesville, let alone the others.

The coroner's jury would appear from their verdict to be not above the average of their kind, and their criticism of the track and the speed are not to be regarded as weighty without more evidence than has yet been shown; but as to the simple matter of removal of track bolts they certainly ought to hit somewhere near the truth, and we understand that the evidence of malicious work is accepted by the Chairman of the State Railroad Commission, a former railroad officer. As long as the derailment of a train can be easily accomplished in almost any locality without special tools we lay little stress on the fault of leaving tools outdoors, though this criticism of the jury is not wholly unwarranted. The details of the Statesville wreck were among the most heartrending ever reported, but they were not so fully "written up" by the reporters as is usual, and, with this and the increasingly frequent reports of disasters (owing to the more thorough diffusion of news throughout the world) the special lessons of this case will, we fear, be lost. What percentage of passengers must be killed before we shall stop trusting our lives to the tender mercies of drunken tramps every night?

Progress of Compound Locomotive Building.

Nothing so well indicates the continual progress in building compound locomotives in this country as the continued reports from locomotive builders that they are getting ready to build such engines. Most of the prominent locomotive builders have devised schemes for starting gears, and at least four of them have built compounds which are now being tested.

The progress of the Baldwin four-cylinder compound we have noted heretofore. Nearly 100 have been built or contracted for up to this time. The Baldwin Works also have a two-cylinder compound which has not yet been tried. The intercepting valve is of novel construction, and has been patented by Mr. Vauclain, the inventor of the four-cylinder compound. The designs of this valve have not been made public.

The Rhode Island Locomotive Works have devised a starting gear which has been put upon the Brooklyn Elevated Road and one large engine has been built and

tried on several eastern roads; it is at present on the Boston & Albany.

The Schenectady Locomotive Works have built a considerable number of engines with the first form of the Pitkin intercepting valve, and are now building others with a second and improved type of valve.

The Pittsburg Locomotive Works have a plan of a starting gear which they are perfecting. They have not yet built a compound locomotive under that plan.

The Rogers Locomotive Works have devised an extremely simple form of intercepting valve which they are ready to apply to any two-cylinder compound for which they may have orders.

The Brooks Locomotive Works, as we have stated in another column, have just turned out a large mogul engine having two cylinders, one high and one low pressure, with a new form of intercepting valve, with which they are experimenting. This engine is considered to be only in an experimental stage. They are expecting that the present tests will teach what it is best to do with future orders for compound engines.

In addition to this list, compound locomotives have been constructed by several railroad companies. The C. B. & Q. engine is now running very successfully in freight service, saving from 15 to 25 per cent., according to the train loads. Of course the heavier the load the greater is the saving. The starting-gear for this engine has been changed once or twice to enable the engine to get away from a station faster with a heavy, close-coupled train and to start freight trains on grades.

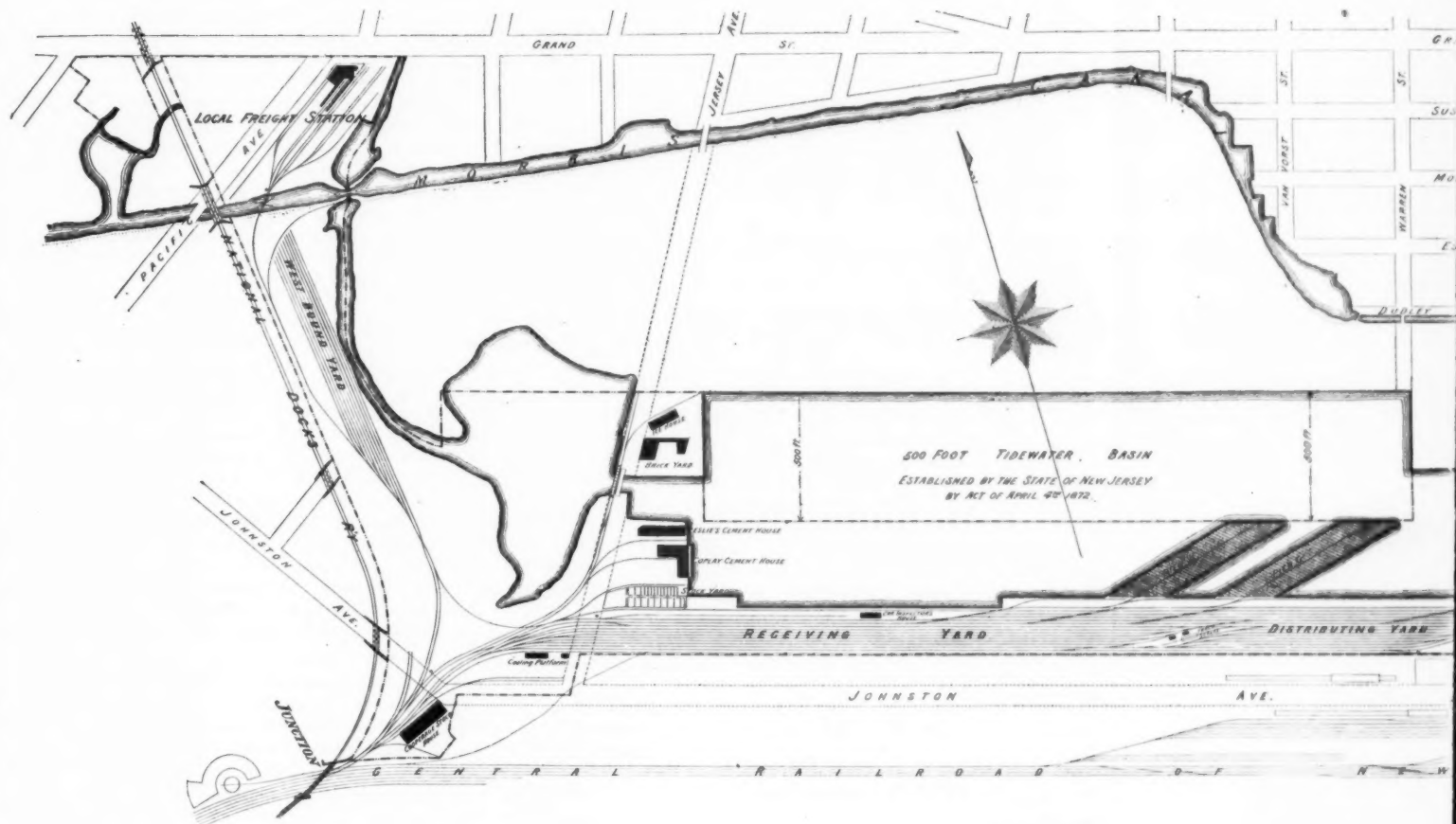
The mechanical department of the Pennsylvania Railroad has completed drawings for a two-cylinder compound with the Lindner starting gear. The construction has only just commenced in the shops, and it may be some time before the engine will be completed.

The Old Colony Railroad has just completed the two-cylinder compound designed for that road by Mr. F. W. Dean. It has the Dean starting gear and carries 180 lbs. pressure. This engine is remarkable in several respects, the ports being 24 in. longer on the low pressure cylinder and the high pressure ports in proportion. Further, the steam chest valves are as large as any that have ever been made in this country. A thorough test will be made of this machine as soon as it is in perfect working trim. The report will, it is expected, throw much light upon the value of the two-cylinder compounds for passenger service, particularly in this case, as the engine is to be tried against a simple engine carrying 200 lbs. pressure, which is the design of Mr. J. N. Lauder, Superintendent of Motive Power of the Old Colony. Mr. Lauder has always been an advocate of high pressures, and even now believes that with a higher pressure he can get results equal to those gained by compounds.

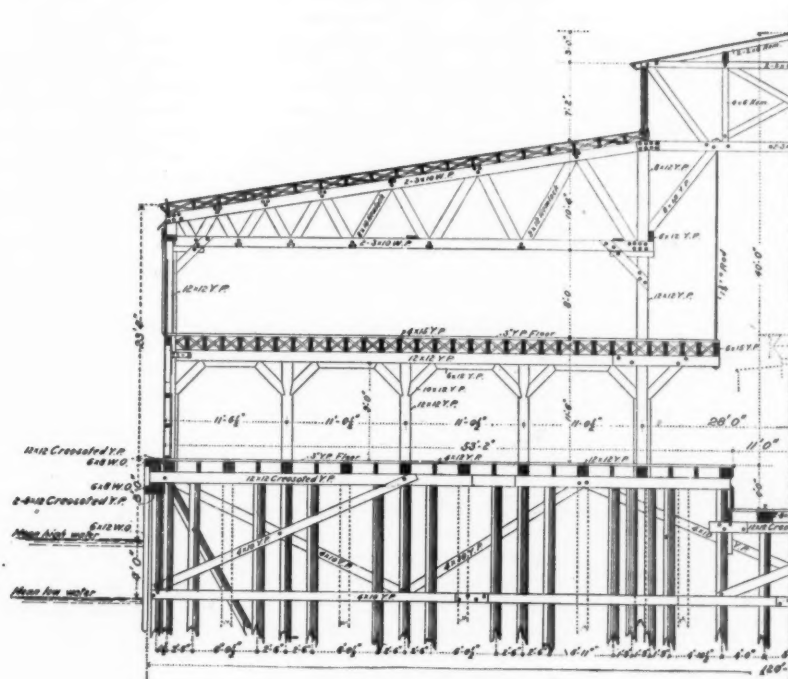
There are rumors that several other roads in this country are designing compound locomotives. The "Alley" elevated road in Chicago will undoubtedly be equipped with the compound engine. Whether they will all be compounds or not remains to be decided. On the whole, then, we may say that the compound principle is being well and thoroughly tried in this country, and there is to-day, after such experiments as have already been performed, a decidedly increased confidence in the advantage of compounding where the engine is to be subjected to heavy work; but we cannot say that there is an increased confidence in the value of compounding for high speeds and light loads.

The Principles Governing Railroad Rates.

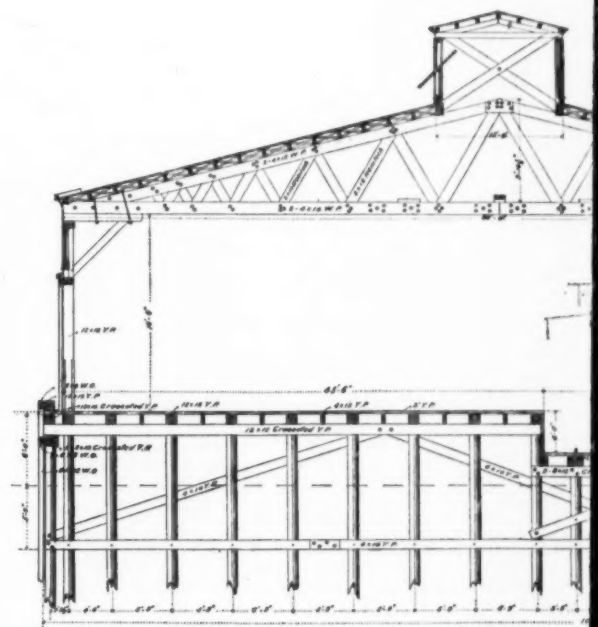
In the early infancy of the *Railroad Gazette*, and in the last years of its predecessor, the *Western Railroad Gazette*, the Granger agitation forced upon railroad men and legislators the consideration of the principles which govern the charges for transportation, to an extent previously unknown in this country, or, probably, anywhere else. Railroad managers and railroad attorneys in the West suddenly found themselves called upon to explain and defend their practices, and it is not too much to say that the call found them unprepared. Experienced and conscientious traffic managers—the title was then scarcely known, but the functions of course had been exercised by general freight and passenger agents, superintendents and presidents—when asked to explain why they made certain rates very different from others for services which seemed similar, often were not able to give any reason satisfactory to themselves. They knew they could not help themselves, but as for an analysis of the facts and principles which governed the application of the different rates, they could not state them; they had not reflected on such matters, and the absence or inadequacy of explanations advanced by the railroad authorities to justify discriminations in rates, which



General Plan.
Covered piers are cross hatched.

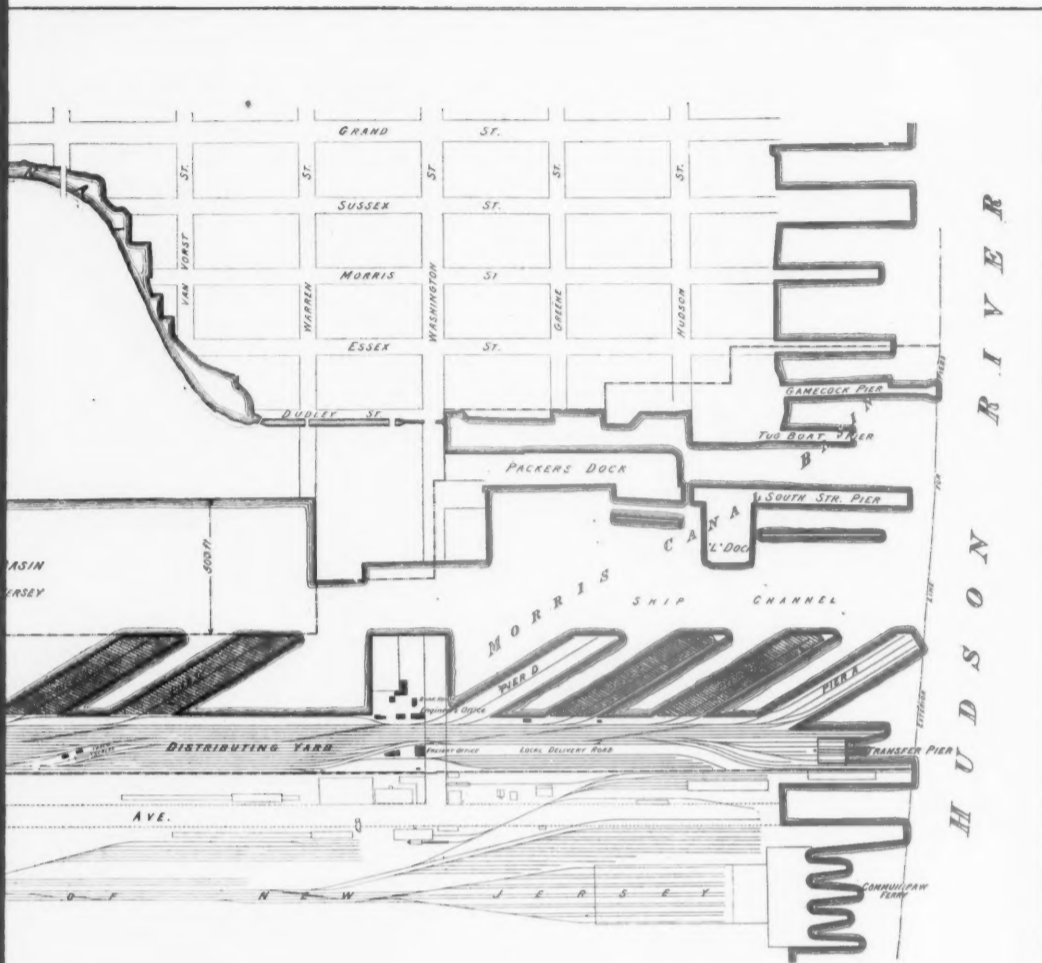


Double Story Covered Pier.

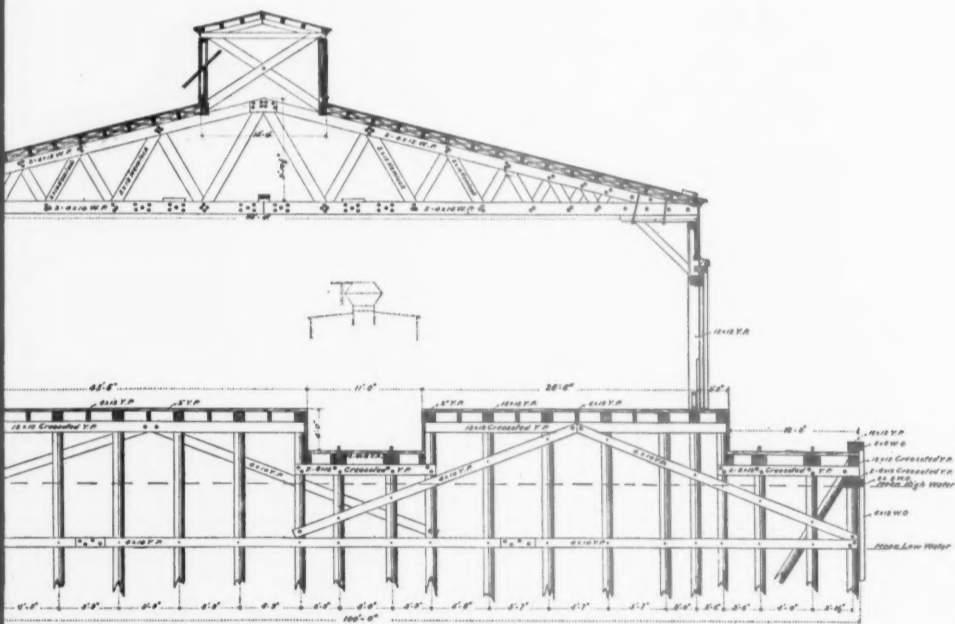


Single Story Covered Pier.

FREIGHT TERMINALS OF THE LEHIGH VALLEY RAILROAD—JERSEY CITY, N. J.

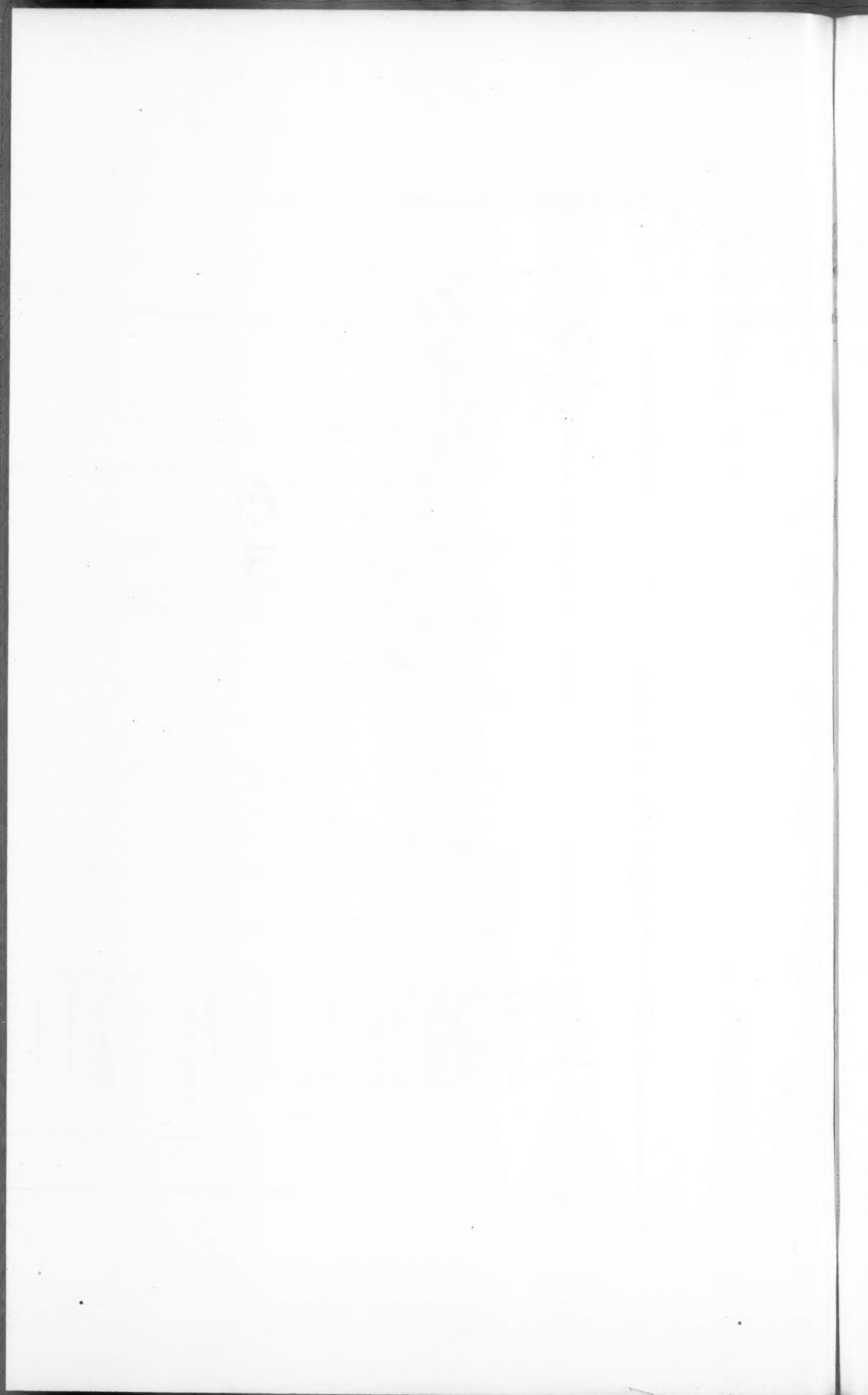


hatched.



Single Story Covered Pier.

RAILROAD—JERSEY CITY, N. J.



in most cases were perfectly proper, had a very bad effect upon the public and the legislators.

The *Railroad Gazette* could not avoid taking part in the discussion of these questions which so vitally concerned the railroad interest. But when it searched for precedents for similar discussions, for the judgments of experts in transportation and of economists, it found substantially nothing. In fact, at that time nothing of importance existed in the English language, and the continental publications bearing on the subject, which had already developed to a considerable extent what we may call the economics of transportation, were unknown in this country and apparently in England, and were not discovered by the *Railroad Gazette* until the heat of the discussion was over.

It, therefore, found itself compelled to make, so far as it was concerned, an original investigation, and from the chaos of facts and experiences cited by the public and related by railroad officials who had been forced upon their defense, to search for principles governing the equitable application of transportation rates. Little by little, in course of time, it arrived at and propounded certain conclusions, most of which it has had no reason to disavow since. But for a long time it found no other support for these conclusions than its own investigations and reasonings, and their adoption by some intelligent men familiar with the business of transportation in different parts of the country.

To one who has been through such processes, involving the establishment of general principles from a mass of economic facts and experiences, it is very encouraging to find that other serious investigators, in another field, from a different body of facts, have come to similar conclusions. The *Railroad Gazette* has found such encouragement not infrequently in French and German railroad and economic literature, from which it has cited from time to time, especially since 1872. But it is in the year 1890 that it found the most striking statement of views which it had slowly and painfully elaborated during many years, emanating in a field where the railroad policy is and has been almost from the beginning totally different from that of our country, and, indeed, unlike that of any other country. This is in a work intended not particularly for railroad men, but for merchants, prepared by an officer of the French Corps of Bridges and Highways, who has a place in the government Council which passes upon rates proposed by the French railroads before they are approved or disapproved by the Minister, whose "homologation" is required for every new rate or change in rates. He has also for several years been charged by the French government with the instruction at the Paris Commercial High School on the subject of transportation and the charges therefor.*

In passing over this volume, or those parts which treat of the principles governing railroad rates, a veteran of the *Railroad Gazette* is continually stumbling upon what seems his own work, so that to commend the work in these columns seems almost like self-praise—the conclusions being really those drawn by other observers and reasoners in a very different field, but in a great many cases identical with those which the more or less able editors of this journal had been arriving at during the last twenty odd years.

We will not now attempt a review of Mr. Colson's book, which in almost all its parts will be found of very great interest to students of transportation everywhere, but will content ourselves with citing some of its conclusions.

There has been no such experience with rates in France as we have had in this country, for the reason that all rates there have, from the beginning, been dependent on the approval of an authority representing the public. But that authority has not only had to consider the interests of the public as patrons of the railroads, but of the public as responsible for the interest on their cost, the state being really the proprietor of the railroads in France, while the companies which work them have what is equivalent to a long lease of them, in payment of the part which they have contributed toward their construction with a certain minimum interest guaranteed, but on the other hand subject to the direction of the government as to the methods of construction and working, and to its approval as to all rates which they may charge for services rendered.

* C. Colson, Ingénieur des Ponts et Chaussées, Maître des Requêtes au Conseil d'Etat.

Transports et Tarifs: Précis du régime des routes et chemins, canaux et rivières, ports de mer, chemins de fer. Lois économiques de la détermination des prix de transport; prix de revient, statistiques du trafic. Tarifs de chemins de fer français; comparaisons avec les principaux pays étrangers.

Transportation and Rates. Notes on the regulations followed on roads and highways, canals and rivers, seaports and railroads. Economic laws which determine the charges for transportation; cost; statistics of traffic. Rates of French railroads; comparisons with the principal foreign countries. By C. Colson, Engineer of Bridges and Highways, Maître des Requêtes in the Government Council. 1 vol., 8vo., pp. 479. Paris: J. Rothschild, 1890.

The state thus is checked in its efforts to secure the best and cheapest service by the certainty that every service which costs more than it brings in will add so much to the sum which the state pays for interest guaranteed and not earned, which in the aggregate is a very large amount yearly. Whatever may be said as to this as a state railroad policy, there can be no doubt that it makes the government authorities in charge of railroad affairs interested students of everything relating to railroad rates.

A government bureau, provided with a force of experts in engineering and transportation having to pass an opinion on all rates made by all the railroads, with the knowledge that all the mistakes it makes must be paid for, either by shippers denied rates which might have enabled them to extend their industries, or by the tax payers, to make up interest charges which the railroads fail to earn; hearing the propositions of the companies for new rates or changes in rates, and the arguments of all interested parties for or against the approval which alone makes them valid; such a bureau would seem to be an ideal place to learn the principles governing rates. It would be more nearly so than it is if there had been in France the almost unlimited freedom in making rates and the equally unlimited competition which we had until late years, and which have given us a body of experience unequalled and unapproached anywhere else, one of the results of which has been that rates are profitably made here, on which the existence of the chief industries of large parts of the country depends, which are considered altogether out of the question almost everywhere else in the world, and would probably never have been attempted here if experience had not shown them to be profitable at once to the carriers and the public, and unrestrained competition, which in many respects has brought about serious evils, had not given us the experience. But let us return to Mr. Colson's book.

The first principle governing rates, it says, is the value of the transportation. This value is measured by the difference between the price of the goods at the point of shipment and the price at the point to which they are sent. This difference is the maximum which it is possible to charge. At a rate higher than this no shipments will be made.

The limit on the other hand is the cost of the transportation. But here it is important to distinguish between the average cost of the transportation of a unit of traffic, and the amount which is added to the expenses by the transportation of an additional unit. The lowest price at which a carrier has an advantage in transporting a given shipment of a ton of freight a hundred miles is not the average cost of carrying one ton one hundred miles, but the cost of carrying an additional ton 100 miles—a very, very different thing. The cost of carrying the additional ton (*la tonne en sus*), as Mr. Colson puts it, is the really important element. This is a very convenient expression for a fundamental element in rate making, which it will be well to transfer to our language.

This "cost of the additional ton" has little application to cartage and carriage by boats, because there is almost as great an addition to the expenses for carrying the new ton as the average cost of carrying the old ones. But when large vessels have to make trips at stated intervals, it may often be very different; and on railroads, where in addition to a stated service of trains there is a very large expenditure for the use of the road on which the trains run (interest and maintenance), the difference may be enormous. The French railroads are by their charters required to run, some two and some three, trains, each way daily as a minimum. "If these trains run empty, the cost of hauling them is a trifle less than if they ran full; but the difference is not large; and so long as there is not traffic enough to compel an increase in the number of trains, the transportation of a ton in addition to that which already exists, involves, so to say, no additional expenses. Even when the number of trains is increased, the increase in the expenses is far from being proportional to the increase in traffic."

Passing from the cost of transportation proper to the "toll," or charge for the use of the road on which the trains run (which is carefully distinguished throughout Mr. Colson's discussions), it is evident the additional ton involves scarcely any additional expense. The cost of the road is the same until a very large addition to the traffic requires additional sidings, second tracks, station accommodations, etc., and even then the additional expense for interest is very small per unit of additional traffic. Of the maintenance of road expenses which go to make the other part of the "toll," a portion of them do not increase at all with the traffic and the rest not in proportion to it.

Where there is competition, the price of transporta-

tion naturally descends to the minimum. The shippers go from one carrier to another, and every carrier will gain by every ton he gains, or lose by every ton he loses, at any rate higher than the "cost of the additional ton." Where there is a monopoly, on the other hand, the natural tendency of the carrier having the monopoly is to charge the full value of the transportation. Following a formula which has become famous, in this case, the sole carrier makes the freight pay "all that it can bear" (*tout ce qu'elle peut payer*).

The portion of the price of transportation included in the "toll," says our author, is by its very nature the object of a more or less complete monopoly. "If there is but one route between the places served, there is an absolute monopoly; if two points are connected by several routes, the monopoly may be divided; but competition will never be the normal condition, for it is an economic maxim that whenever coalition is possible, competition is impossible. Now coalition is always possible between those who control routes serving the same traffic. The expense of constructing lines is, in fact, so great that the number of those existing between any two points must always be very restricted; if, then, these lines are in the hands of different parties, the latter would have to be very destitute of wisdom not to come to an understanding in the end."

Ah! we have heard of that before, but we are beginning to believe in this country that the "economic maxim" has got turned around, and that the true reading of it is, "where competition is possible coalition is impossible." And as to the cost of construction preventing any considerable number of competing lines between any two points, how many lines are there between New York and Chicago? How many between Chicago and Kansas City? How many between Chicago and St. Paul? The controllers of different lines between two places must be very destitute of wisdom not to come to an understanding in the end? The managers of our competing lines have not come to an understanding, and as to their being very destitute of wisdom, we would have Mr. Colson know that—that that is a very delicate subject to discuss!

The author calls particular attention to the fact that while in most industries the effect of supply and demand is to fix prices at a rate which gives the capital invested in these industries a return equal to the ordinary rate of interest, the rule does not apply to transportation routes (roads, railroads or canals). "On the contrary, the capital invested in these routes has, so to say, no influence on the fixing of the tolls. What constitutes the supply, in this, is the transportation facilities offered to the public by the routes made at the cost of those who collect the tolls. Now insufficient remuneration of the capital has no effect in restraining this supply; for the sum invested in the works can never be withdrawn from them to seek some more profitable employment, and, consequently, so long as the tolls on any route yield a sum a little greater than the cost of maintenance, this route will not be abandoned, even if the capital receives no interest at all." He says that, on the other hand, however productive the tolls may be, the great profits will not cause competing routes to be built, "because the creation of routes of transportation is not a free industry"—a statement which is true in Europe, but not here, as every holder of New York Central and Chicago, Burlington & Quincy stock can testify.

We give elsewhere a translation of a portion of Colson's Chapter VI., in which he illustrates by an ingenious diagram "the influence of tolls on the utility of transportation routes," by tolls being understood the entire charge for the use of a route—interest on cost and maintenance of the route, but nothing for the movement over the route.

Interstate Commerce Commission Reports.

The blank forms for railroad reports to the Interstate Commerce Commission have been sent out, covering the year ending June 30 last. They do not differ much from those adopted for the previous year. As an indication that the forms as thus made up are coming into general use, it may be stated that for the fiscal year just closed the Commission has furnished annual report blanks to 22 states, including Alabama, Connecticut, Georgia, Iowa, Kansas, Kentucky, Minnesota, North Carolina, Nebraska, Ohio, Texas, Virginia and Wisconsin. This influence toward uniformity in style of accounts is very great and is on the whole for good.

A rather curious fact in this connection is that the Commission by resolution refused public access to the reports of railroad companies made to it, referring all inquirers to the Statistician's annual volume. If, however, state boards are printing their reports in full as made up on Interstate Commission's blanks, secrecy can no longer be expected. Those companies who think that

their internal affairs are not a public matter, cannot rely upon further concealment.

Accompanying the general reports and supplementary thereto, the Statistician of the Commission is sending out special forms. One of these relates to grouping. It was noted in the Statistician's volume for 1889 that averages for the whole country were, in railroad matters, next to worthless for any practical or legislative purpose. Hence, since railroads had arranged themselves in groups, the averages by these groups would be more serviceable. Some groups were easily treated. New England, for example, has its own defined roads with particular characteristics. But a group to embrace the roads in the Central Traffic Association presents more difficulty. What should be done with the Wabash? Every one knows that railroad conditions between Chicago or St. Louis and the Missouri River are entirely different from those east of those cities. A sharp line must be drawn at Chicago if we are to form groups having distinct features. "Poor's Manual" fails at this point. Its so-called "Central Northern Group" embraces Ohio roads and also all centring in Illinois, so that the Manual's average is made up by including the Lake Shore with the Milwaukee & St. Paul, for example, thus rendering any deductions from these group statistics of small value.

The Interstate Commission is trying to get over this difficulty, with what success time must show. The statistician to perfect his groups must divide the figures of some railroads into separate parts for the separate groups into which their lines run. The Rock Island must be asked to give returns for its lines east and west of the Missouri River, if the roads west of that natural boundary are to be made into a separate group. But railroad accounts are not kept in this way, but as a whole, and these requests of the Commission may entail large expense upon some roads, the Wabash, for instance. How far should a road whose line happens to run into two or more groups be expected, at its own cost, to furnish information to carry out a grouping plan on the part of the Commission?

Comparative monthly statements are now called for, showing all earnings, income and deductions. This is in accordance with a resolution adopted June, 1890. But why monthly? Would not quarterly returns, as required by some State Boards, answer every purpose of the Commission? At any rate, statements of net earnings and proportion of fixed charges for any period, would be welcomed by the public. It is possible that the periodical information to which the public may be considered to be entitled, will in time be thought ample for the use of the Commission.

Other blank forms require very complete and careful statements of new mileage for three, nine and twelve months. In this way accuracy ought to be obtained.

We can only repeat our former remark, that it is much to be regretted that the published reports of the Commission's statistics should be so long delayed. The volume for 1890 is now 14 months behind its date, and for many purposes to which it might have been put, will be useless when issued. The machinery of the Statistician's office ought by this time to be so well arranged, and the reports of the various railroads ought now to be so promptly forthcoming, that volumes for the fiscal year ending June 30 might be in the hands of Congress and the public by the beginning of the calendar year.

Annual Reports.

Boston & Albany.—This report is for the year ending June 30, the fiscal year of the company having been changed in 1880. The principal figures are:

Earnings:	
Passengers.....	\$3,883,452
Freight.....	1,373,988
Mails and other sources.....	958,782
	\$9,216,222
Expenses:	
Maintenance of way.....	\$1,408,806
" engines.....	426,745
" cars.....	762,687
" buildings, docks, etc.....	156,345
Transportation.....	3,876,126
General.....	177,042
	6,807,751
Net income.....	\$2,408,471
Less charges:	
Interest.....	\$468,842
" accrued, not due.....	194,058
Dividend, 8 per cent.....	1,600,000
Rentals.....	78,000
	2,340,900
Surplus not divided.....	\$67,571
Surplus, June 30, 1890.....	32,597
Surplus, June 30, 1891.....	\$100,168

The passengers increased 392,432, or 3.5 per cent. in number, and 10,723,302, or 5.3 per cent. in mileage, while the passenger earnings increased \$114,591, or 3 per cent. The average fare received was 1.83 cents per mile. Last year it was 1.87 cents. There is nothing in the report to account for this decrease in rate, for the way passengers were a smaller proportion of the total than in the former year, and therefore the rate would naturally have been greater rather than less. Indeed the ratio of way to through passengers remains remarkably steady on this road notwithstanding the careful and well considered cultivation of the suburban and excursion business. In 1872 the way passengers were 98.7 per cent. of the whole; in 1880 they were 98.9 per cent. and in 1891, 98.9 per cent.

The relation between passenger and freight earnings

on this road is one not often found. That is, the passenger earnings were over 88 per cent. of the freight earnings; in 1890 they were over 85 per cent. On the New York, New Haven & Hartford the passenger earnings are even greater than those from freight, and on the Boston & Maine they are also greater, but this is a state of things that is perhaps reached nowhere out of New England except on local roads. To be sure the Long Island has passenger earnings more than twice as great as those from freight, but the peculiarities of this road are obvious at a glance.

The tons of freight carried increased slightly (less than one per cent.) and the ton miles fell off about one-fourth of one per cent. The freight earnings decreased about 1.6 per cent. The rate was 1.09 cents per ton per mile, a reduction of .05 cent from last year, but a gain over 1889.

The report mentions the facts that much is to be done this year in the way of equipping with the M. C. B. Coupler and the air brake, and in continuation of the work of estimating grade crossings. During the year of the report \$250,000 was spent for the latter purpose; 10 grade crossings have been separated during the year, and 16 are in process of construction. Decrees to abolish six more have been rendered, the work on which will be commenced as soon as the contracts can be made. There remain between Boston and Springfield 45 level crossings, to which the serious attention of the company is directed, as it is the desire of the directors that these should be eliminated as quickly as possible.

The stockholders, at the annual meeting Sept. 24, 1890, voted to authorize an issue of five millions of stock. The issue of stock is to be made on Jan. 5, 1892, and the shareholders in anticipation of such issue have paid into the treasury \$527,320.

Chicago, Milwaukee & St. Paul.—This report is for the year ending June 30, 1891, and for 5,710 miles operated. The principal results for the year are:

Gross earnings.....	\$27,504,224	
Operating expenses.....	18,366,500	
Net earnings.....	\$9,137,724	
Income from other sources.....	334,207	
Total.....	\$9,471,932	
Fixed charges, interest on bonds.....	7,237,252	
Balance above fixed charges.....	\$2,234,680	
Out of above balance $3\frac{1}{2}$ per cent. dividend on preferred stock, amounting to \$767,756.50, was declared, payable in April, 1891.		
The comparative results for two years were as follows:		
	1890.	1891.
Gross earnings.....	\$26,405,708	\$27,504,224
Operating expenses.....	17,173,088	18,366,500
		\$1,098,516
Net earnings.....	\$9,232,611	\$9,137,724
Tons freight.....	9,292,902	10,397,035
Passengers carried.....	7,505,946	7,919,229
Miles revenue trains.....	19,581,174	19,985,317
Mileage loaded freight cars.....	186,715,164	190,973,870
Mileage empty freight cars.....	\$71,739,953	\$71,481,974
Operating expense per revenue train mile.....	87.70 cts.	91.90 cts.
Gross earnings per mile of road.....	\$1,637.70	\$4,816.85
Operating expense per mile of road.....	3,035.72	3,216.55
Net earnings per mile of road.....	1,632.07	1,600.30
Average miles of road operated.....	5,657	5,710

* Decrease.

The rate received per ton mile was 1.003 cents, against 0.905 in 1890. For a series of years it has been: 1885, 4.11 cents; 1870, 2.82; 1875, 2.10; 1880, 1.76; 1885, 1.23; 1890, 1.059. The rate per passenger mile in 1891 was 2.301 cents, and in 1890, 2.333 cents.

The ton miles in the year ending June 30, 1891, were 1,895,035,111, and in the year of June 30, 1890, 1,842,739,845. The passenger miles for those two years were 262,551,100 and 256,389,345.

It will be seen that there was a substantial increase in the gross earnings. The volume of traffic increased and rates were better, both passenger and freight; and on the other hand, there was a gain in some elements of economy, that is, the freight train loads were larger, the passenger train loads did not diminish, the mileage of revenue cars increased and the mileage of empty cars decreased. Nevertheless, we find an increase of nearly \$1,200,000 in operating expenses, and a decrease of \$95,000 in net earnings. Perhaps Mr. Miller attributes too much of the increase of operating expenses to changes in the labor element. He says: "Of the total increase in expenses \$350,000 was for conducting transportation. This is partially due to increased tonnage and partially to the increase of wages and the reduction of the standard of a day's work in train service from 12 to 10 hours." We find an increase in the items of station service and wages of trainmen, engineers, etc., of about 4.5 per cent.; but the increase of tons handled was over 10 per cent., and the increase in ton mileage was 3 per cent. The increase for car mileage was about \$80,000, that is, up to \$283,000. Therefore, while the wage element was undoubtedly an important one, it does not seem to have been so important as Mr. Miller would imply.

Of the total increase in expenses about \$320,000 was for maintenance of property. The item of repairs of track increased 24 per cent., to \$1,817,000; renewals of rails increased \$183,000, and renewals of ties \$300,000. Repairs of bridges decreased \$100,000, there was an in-

crease of about \$30,000 in repairs of locomotives, and nearly \$250,000 in repairs of cars. The maintenance of way expenses included \$250,000 for repair of damages by floods in Iowa, which made it necessary to rebuild 40 miles of roadbed and to relay the track with new rails. This item alone, it will be seen, amounted to two and one-half times the decrease in net earnings. Two and eight-tenths miles of pile and trestle bridges were filled with earth and the entire cost of this charged to the operating expenses.

It has become quite the fashion for Western railroad presidents to write in their annual reports essays on the general railroad situation, and Mr. Miller has availed himself of his privilege and followed this fashion. His contribution to the subject is a weighty one and will doubtless have a certain good effect, although, unfortunately, the legislator, either state or national, has a tendency to learn what a railroad president thinks mostly for the sake of getting on the other side; his simple formula being that the railroads are unpopular, therefore by opposing them, right or wrong, he can get votes. However, there are evidence of rays of intelligence penetrating even into the halls of the legislatures.

Mr. Miller points out, among other things, that rates cannot be maintained so long as pooling is prohibited; moreover, he says maintenance of rates will not relieve the American railroads from the disastrous effects of competition with foreign roads. He speaks in moderate terms, but apparently with a little hope, of the Western Traffic Association. He has a word also to say as to the actual cost of existing railroads and the charges of over-capitalization.

One point that he makes is very significant and is sure to become of more and more importance. That is, that the railroads, directly and indirectly, are the greatest employers of labor, and that labor has actually more interest in their prosperity than capital has. The direct payments of his company for labor during the past year amounted to \$12,500,000, and the direct and indirect payments amounted to \$17,700,000. He shows also the interest to the public of sufficient prosperity of the railroads to enable them to keep up their property and their service to the high standard now demanded.

The Chairman of the Great Western Railway, of England, announces that on the 20th day of next May the broad gauge track of that system will no longer be used. When Mr. Acworth wrote, in 1889, the Great Western had only 426 miles of broad gauge out of over 2,500 miles of line, and of this 293 miles had a third rail. Out of 100 trains leaving Paddington station and freight yards daily, but 7 passenger and 3 freight trains ran on the broad gauge tracks. Following is what the Chairman said of this matter at the half yearly meeting, Aug. 13:

The reasons are substantially these: First of all, great difficulty arises in regard to a portion of our traffic. The expense of transfer is large, and the expense of increased stock is large, for we have to transfer perishable goods from one gauge to the other. At the present moment we are feeling the pinch of it very much, as since the construction of the Severn Tunnel a large traffic has developed, and is increasing between the centre and the north of England, and even as far as Scotland. Between Torquay and Plymouth and the southwest coast of England, too, the traffic is valuable, and at the present moment every passenger who comes from the narrow gauge district has to change somewhere onto the broad gauge to get to Torquay. We cannot continue the broad gauge stock in a state of efficiency except at a great cost. Our broad gauge passenger trains are now reduced to six daily, and we have not more than two broad gauge goods trains running. We have decided to discontinue the use of the broad gauge on May 20, next year. It is a big thing to do, but almost bigger than the alteration of the gauge is the question of the alteration of the stock, because we have between 3,000 and 4,000 wagons to alter, also upward of 700 carriages, vans, etc., and about 200 engines to alter, and all this has to be carried out simultaneously with the alteration of the gauge. We have had a large amount of stock constructed of late years, so as to be easily adaptable to the narrow gauge. We are not doing it because we like it, but because it is inevitable, and our officers anticipate that we shall get a large and substantial increase of traffic for the alteration. We shall be much disappointed now if we do not also make a substantial diminution in the cost of working, not only as regards the stock, but the complications of crossings and switches where both gauges exist is something terrible to look at. To meet the cost of the conversion of the gauge it is necessary to provide an amount of capital in excess of the ordinary requirements of the company. To meet the cost of that work, and of the alterations which are going on in connection with the doubling of the line, and so forth, we came to the conclusion to offer to the shareholders the new stock, and £1,000,000 has been allotted. That is sufficient for present purposes, but we have also large borrowing powers.

And so passes away one of the monuments of the illustrious Brunel. It is too late to speculate whether he was right or wrong in his theories. Circumstances have been too strong for the theory; and even in the United States, where there once seemed to be a great chance to work out to its logical end the doctrine that the gauge should have some relation to the average length of haul, that chance no longer exists. The broad gauge philosopher must attack some new continent if he would demonstrate his theory. We commend this idea to the Central African Railroad men. They can find there virgin soil and make their 10th parallel railroad the backbone of a great 7-ft. gauge system that will vindicate Brunel.

The Boston & Maine's answer to the complainant made before the Interstate Commerce Commission by Senator Chandler, of New Hampshire, is interesting chiefly in

practice based on his results should be made with great caution.

Another remarkable statement is (page 20) that the film of oil between surfaces is one-twentieth inch, and that polished surfaces cannot carry loads that may be borne by rougher ones. Goodman's measurements* of a lubricating film give four ten-thousandths inch as the maximum under fairly ordinary conditions with bath lubrication. Also the fact that a standard plug and ring fitting within one ten-thousandth inch can be easily lubricated with the most viscous oils proves that the film is of infinitesimal thickness. That surfaces which have acquired a high polish automatically by long running, are the best for long pressures and severe conditions of service, is universally attested by practice and testing machines alike.

Chapters IV., V. and VI., which are devoted to the discussion of bearing metals, methods of lubrication and journal-box construction, are fairly interesting and practical, but the subjects are not at all exhaustively treated. In Chapter VII. the cost of lubrication of a single journal per 1,000 miles travel is computed on the following assumptions:

Cost of coal per ton.....	\$1.50
Coal per indicated horse power.....	4 1/4 lbs. per hour.
Cost of lubricant per gallon.....	\$0.22
Lubricant consumed.....	0.50 lb.
Wear of brasses (one-half brass worn away before removal).....	0.75 oz.
Wear of axles (15 lbs. worn away before removal from service).....	3.00 "
Cost of brass worn away per pound.....	\$0.16
Cost of new axle, 375 lbs.....	8.50
Value per pound as scrap.....	0.01
Waste used per journal.....	1.40 lb.
Oil to saturate waste.....	8.40 "

The cost of lubrication is then given as follows:

Coal.....	0.926 cents.
Lubricant.....	1.250 "
Loss of brass.....	1.120 "
Loss of axle.....	1.370 "
Waste and oil to saturate.....	1.083 "

Total per 1,000 miles per journal.....5.759 "

The coal consumption we think is in error by being about 3 1/2 times too large, owing to the use of an erroneous formula for horse power. This is set forth (page 53) as follows:

"The horse power developed due to journal resistance would then be per journal per 1,000 miles run."

$$\frac{1,000}{60} \times \frac{d}{d'} \times \frac{J \times T \times 5,280}{33,000} = H. P.$$

d = diameter of journal.

d' = diameter of wheel.

J = pounds resistance at drawbar per ton due journal friction.

T = tons per journal.

On page 55, J is made 3 lbs. (corresponding to a coefficient of friction of 1.2 per cent.); T , 3,750 lbs.; d is 4 in., and d' , 33 in. These data in the above formula give $H. P. = 1.82$, as given by the author. But, the formula contains no time element, without which the $H. P.$ cannot be expressed. Also the resistance J , acting at the drawbar, the ratio — is superfluous.

The formula should be as follows:

$$H. P. = \frac{\text{Space in feet per hour.} \times \text{Force exerted.}}{t \times 60 \times 33,000}$$

$\text{Fl. lbs. per H. P. per hour.}$

t = time in hours necessary to travel 1,000 miles. If the speed per hour be 40 miles, or $t = 25$, we have $H. P. = 0.55$ or about one-third the author's figure.

The final chapter is devoted to heated journals, and is fairly satisfactory, the production of hot bearings being ascribed to: First, Those produced by mechanical defects; Second, Those due to defective lubrication.

On the whole the book is a disappointment, considering the mechanical environments of the author.

Reports of the Massachusetts State Board of Health on Water Supply and Sewerage. Part I., Examinations of Water Supply and Inland Waters, 1870 to 1890. pp. 857. Part II., Experimental Investigations upon the Purification of Sewage by Filtration and by Chemical Precipitation, and upon the intermittent Filtration of Water, 1880 to 1890. pp. 910.

These two volumes present the results of examinations by the State Board of Health of Massachusetts under the provisions of the act to protect the purity of inland waters, the carrying out of which was intrusted to the State Board of Health in 1886.

There is no book on water supply and sewerage published in any language which contains the amount of scientific and practical information regarding the important questions of water supply, sewerage and the filtration of sewage and of water that is contained in the 1,800 pages of these volumes. To attempt to give even a summary of the contents of this report would occupy more space than it is possible for us to devote to it. The first volume is devoted to the question of water supply, and comprises brief but complete descriptions of all the water works in the State of Massachusetts, of the rivers of the state, and also of many available sources of water supply which are not yet utilized. These are followed by reports upon the chemical examinations of the waters, and the interpretation of analyses by Dr. T. M. Drown, the chemist; upon the organisms found in the waters by G. H. Parker; on the

rainfall, flow of streams, supply of water, characteristics of surface waters, and the pollution and self-purification of streams by F. P. Stearns, C. E.

The second volume contains reports on the filtration of sewage and water, and the chemical precipitation of sewage by H. F. Mills, C. E.; report upon the chemical work, and the methods of analysis by Dr. T. M. Drown and A. Hazen; report on the biological work of the filtering station by W. T. Sedgwick and an investigation upon nitrification by E. O. Jordan and E. H. Richards.

One of the most valuable features of the book is that it is an actual record of experiments, giving not only the results, but also the methods followed, and the reasons for adopting these methods. It is remarkably free from any effort to generalize from insufficient data, and taken altogether is the most important contribution to the question of water supply, sewerage and sewage disposal that has, so far as we are aware of, ever been published. Not the least of the merits of these volumes is the fact that they are provided with a complete index of subjects.

The example of the State of Massachusetts in providing for such examinations as are reported in these volumes ought to be followed by every other state in the Union. The State of New York particularly needs precisely such examinations as have been made by the Massachusetts Board of Health; but, as a preliminary to such investigations, it is of great importance that an accurate topographical survey of the State should be made. Such a survey was begun a number of years ago, but, owing to its inefficient management, the appropriations for it ceased several years since, and the efforts which have been made to complete it under the direction of the State Engineer, in whose charge it should properly be placed, have failed, principally, we believe, on account of the opposition of politicians to having any expenditures made for scientific purposes which they cannot themselves control.

The Engineering Magazine, September, 1891.—The paper on "Ventilation," by Leicester Allen, and that on the "State Ownership of Railroads," by Benjamin Reese are continued. Two papers of special interest are "How Niagara's Power Will be Utilized," by Coleman Sellers, and "Tunnels and Modern Methods of Tunneling," by E. W. Moir. Mr. Moir is the engineer for the contractors of the Hudson tunnel now in progress under the North River, and naturally his paper gives considerable space to that enterprise. There are also papers on the work of the Weather Bureau, on Architecture and on the Dynamite Gun.

Proceedings of the Engineers' Club of Philadelphia, April, 1891.—This issue has a varied table of contents, and embraces 80 pages. The topics treated of are: The Demolition of Rocks under Water without Explosives, Rail Joints, Granolithic Pavements, Topographical Surveying, Continuous Rails for Railroads, and the Abnormal Rainfall of 1889. There are, moreover, notes of meetings, book notes, etc. The number opens with the annual address of Mr. H. W. Spangler, retiring President, and contains a handsome portrait of him.

The Journal of the Association of Engineering Societies, August, 1891.—The papers in this issue are the "Chemical Precipitation of Sewage," by Allan Hazen, of the Boston Society; and the "Late Suspension Bridge at Minneapolis," by F. W. Cappelen, of the Minneapolis Club. It contains also society proceedings, and the "Index to Current Literature."

TECHNICAL.

Manufacturing and Business.

The Arcadia, Gulf Coast & Lakeland Railroad is in the market for steel rails, drawbridges, crossties piling, and other material for use in constructing a new road. Anthony Peters, of Arcadia, Fla., is President of the road.

The Columbia Supply Co. has filed articles of incorporation with the Secretary of State at Springfield, Ill., with C. D. Leach, C. A. Cox and John Francis, as incorporators, to manufacture railroad supplies. The capital stock is \$300,000.

James P. Kennedy was elected General Manager of the Youngstown Bridge Co. at a meeting of the directors recently held in Youngstown, O. Mr. Kennedy was formerly with the Andrews Bros. Co., proprietors of the Hazelton Iron Works at Niles, O.

Ritter & Conley, of Pittsburgh, recently shipped two girders for traveling cranes, being built for the Government, to the Morgan Engineering Co., at Alliance, O., each weighing 27 1/2 tons.

The Newark Machine Tool Works of East Newark, N. J., have received their fifth order for large slotting machines for the navy yard at Washington.

A contract has been entered into with the Babcock & Wilcox Co. to furnish two Babcock & Wilcox tubular water boilers and to furnish the material and build the foundation for one engine and three fire pumps for temporary power, lighting, and fire service at the World's Fair site at Jackson Park, Chicago.

The Jull Mfg. Co., manufacturers of the Jull snow excavator have removed their offices from 329 Fulton street to 189 Montague street, Brooklyn, N. Y.

The Wanamaker Car Scale Co., of Indianapolis, Ind., has opened an office in room 10, Rookery Building, Chicago.

A new board of directors was elected at the annual meeting of the stockholders of the Bargon Compound Rail Co., recently held in San Francisco, Cal., and L. W. Kennedy was elected President to succeed W. F. Boardman.

The Construction Company of the Single Rail & Saddle Track System has been incorporated by John Meyers, H. P. McGuire, R. Clinton, Z. T. Wright, J. B. Mahana,

George C. Sears and A. P. Armstrong, of Portland, Or., for the purpose of building a one-rail railroad in that city.

H. W. Ensign, of the Ensign Mfg. Co., Huntington, W. Va., will be the superintendent of the new freight car works to be built by the Canda Mfg. Co. at Carteret, N. J. An order has been placed with Craig Ridgway & Son, of Coatesville, Pa., for hydraulic cranes for these shops.

The Chicago Equipment Co., of Chicago, has been incorporated in Illinois to manufacture railroad equipments; capital stock, \$1,000,000; incorporators, R. H. Pugh, R. Willforce, H. S. Monroe.

Fairbanks, Morse & Co. have recently shipped a 400-H. P. boiler and a 50 H. P. Rice automatic engine (second order) to the Provident Chemical Co., Carondelet, Mo., a 40 H. P. engine to the Mallinckrodt Chemical Co., St. Louis; and two 55-ft. 50-ton scales to the Kansas & Texas Coal Co. They have received an order from the Swartz Elevator Co. for two 50-ton railroad track scales and a 30 H. P. Rice automatic engine; and an order from the St. Louis Stamping Co., for four large steam pumps, boilers, heaters, etc.

The annual meeting of the Westinghouse Air Brake Co. was held at Wilmerding, Pa., Sept. 1., and the following Board of Directors was elected: George Westinghouse, Jr., Robert Pitcairn, H. H. Westinghouse, John Caldwell, T. W. Welch, A. M. Byers, and W. W. Card. George Westinghouse, Jr., was re-elected President, and Robert Pitcairn, Vice-President. The report showed gross earnings, \$5,004,179. and net earnings, \$1,695,795.

Iron and Steel.

The Proctor Steel Co. will erect a steel plant at Johnson City, Tenn., to cost about \$400,000, and have a capacity of from 100 to 150 tons daily. This is the only company in America using the Russian steel-making process.

The Vulcan Iron Works will erect two new one-story buildings 70 x 227 and 47 x 106 ft. respectively. The works are owned by the Bridgeport Malleable Iron Co., and are located at New Britain, Conn.

The Milton Iron Co., of Milton, Pa., has recently added to the rolling mill department of its plant a new 10-in. guide train, made by the Mahoning Foundry & Machine Co., of Danville, Pa.

Wm. Todd & Co., Youngstown, O. have begun work on the new erecting shop 100 x 168 ft., with a wing 100 x 18 ft. New machine tools capable of handling the largest work, will be put in the machine shop. The erecting shop will be furnished with a 30-ton overhead electric traveling crane, built by the Morgan Engineering Co., of Alliance, O. The company recently built a pair of 34 x 43 in. reversing engines for the Cleveland Rolling Mill Co., and has nearly completed a 36 x 48 engine for Singer, Nimick & Co., of Pittsburgh.

The Alabama Rolling Mill Co., has completed the seven additional puddling furnaces at Gala City, Ala., and expects to resume operations about October. A new gas furnace has been started and new rolls are being put in to make T rails from 8 to 20 lbs. The company expects to resume operations by Oct. 1.

Swift's Iron & Steel Works, at Newport, Ky., which has been idle for several years, has recently been purchased by the Cincinnati Corrugated Roofing Co., and is now running full blast. There are eight puddling and two scrap furnaces, two sheet mills in the new shop and two sheet mills in the old. The product is sheet iron.

The Excelsior Iron Works, of Chicago, Ill., will erect a five story machine shop 74 x 91 ft. The structure will cost about \$40,000.

Messrs. T. S. Marvel & Co., Newburgh, N. Y., are building two steel cargo lighters for the Panama Railroad Co., each 111 ft. in length, 24 ft. beam, and 9 ft. depth of hold. They are also building a gate for the Port Royal Dry Dock.

It is stated that the South Tredegar Iron Works will pass into the control of new owners and the plant greatly improved.

The Etna Iron Works, of Norfolk, Va., recently burned, will be rebuilt at once on a more extensive scale.

The Bessemer Rolling Mill, at Bessemer, Ala., will be sold by public auction on Sept. 14.

The Denison Rolling Mill Co. was recently incorporated at Denison, Tex., by T. M. Duncan and E. P. Durango, of Chattanooga, Tenn., and J. T. Munson, of Denison, with a capital stock of \$30,000, for the purpose of erecting rolling mills, furnaces, etc., to manufacture iron and steel.

The Sharon Furnace, at Sharon, Pa., has been leased by Naylor & Co., who will improve and enlarge the plant. It is expected that the furnace will be ready to go into operation some time during the next month.

The annual meeting of the Pittsburgh Forge & Iron Co. was held at Pittsburgh, Pa., recently, and F. E. Richardson was elected secretary, to fill the vacancy caused by the death of James K. Verner. The following Board of Directors was elected for the ensuing year: Calvin Wells, James Verner, W. W. Speer, John H. Dazell, Ogden M. Edwards, B. H. Rubie and F. E. Richardson.

The Rail Market.

Steel Rails.—The quotations at New York are \$30.75 @ \$31 at tidewater; Pittsburgh, \$30, cash, f.o.b. at mill.

Old Rails.—At Pittsburgh old iron rails are quoted at \$23.50 @ \$24; no sales are reported above \$23.50; Chicago, old iron rails are \$22.75, bid; and old steel rails are quoted at \$14 @ \$16.

A Brooks Com pound.

The Brooks Locomotive Works, Dunkirk, have built a compound locomotive for the Lake Shore & Michigan Southern. It is of the two cylinder type—cylinders 17 and 28 x 24. It is a 10-wheeler and has made some trial trips in freight service.

The Engines of the Cruiser Maine.

A preliminary, operative, shop test of the engines of the cruiser Maine took place on Monday last in the erecting shop of the Quintard Iron Works, foot of East Twelfth street, New York. Quite a large number of invited guests were present.

The engines are of the inverted vertical type, triple expansion, with cylinders of 35.5, 57 and 88 ins. diameter, with 36 ins. stroke, and are designed to develop between eight and nine thousand H. P. at 125 to 130 r.e.volutions per minute and about 780 feet piston speed per minute,

* Paper before Inst. of British Civil Engrs., March 22, '90.

There are two engines each operating its own propeller entirely independent of the other. They are to be separated by a central water tight bulkhead running fore and aft. The low pressure and intermediate cylinders are steam jacketed throughout. The materials of construction are principally steel. All operating connections, including the crank shafts, are of forged, mild steel and the pistons are of cast steel.

The boilers of the Maine are eight in number and 14 ft. 8 in. in diameter by 10 ft. in length, having three steel corrugated furnaces each. There is a sum total of 554 sq. ft. of grate and about 19,000 sq. ft. of heating surface. They occupy, when in position, a space of about 90 ft. long by 35 ft. in width. The engines occupy each a floor space of about 9 x 21 ft., with a length of about 16½ ft. A speed of 17 knots per hour is expected of the vessel, with 9,000 H. P. developed in the engines.

Steel Car Couplers.

The Eureka Steel Car Coupler Company has just completed arrangements with the Alliance Solid Steel Casting Company, of Alliance, Ohio, to manufacture the Eureka coupler entirely of cast steel. This includes the knuckle as well as the head, and the contract provides for the erection of the couplers and delivery to the coupler company ready for service. These couplers are to be built under a strict contract, and the steel company will be held closely to specifications and tests. The new coupler weighs complete 185 lbs., and is now being tested at the Chicago & Northwestern testing department to determine its strength to resist both pulling and compression loads. This coupler, it will be remembered, has a spring in the buffer stop, which gives a double spring resistance to buffing blows. It also has a spring to throw the knuckle open when it is unlocked. It was illustrated in the *Railroad Gazette*, June 5, p. 353.

New Plan for Removing Driving-Wheel Tires.

Mr. F. Hufsmith, Master Mechanic of the International & Great Northern, has devised a very ingenious scheme for removing driving tires without taking the wheels from under the engine. The air from the air pump on the engine is utilized to increase the heat of the gas jets. The device has not yet been developed, but it promises well, and will be an important improvement and save much time in repairing locomotives.

Car Heating.

The New York, New Haven & Hartford has about 400 of its 650 passenger train cars equipped with continuous steam-heating apparatus. The Consolidated, the New York Safety and the Leland systems are used, except on the cars used on the Harlem River branch, which run in connection with the Manhattan Elevated road. These have the Gold system. The Leland, which is a hot-water circulating system, has only lately been tried. Our readers probably know the essential features of this system. The water is heated in each car by steam from the locomotive. As applied on this road the cylinder in which the water pipes and the steam are in contact is placed under the cars. The road has received 100 of these heaters for 50 cars. The Wagner Palace Car Co. has ordered 150 Leland heaters.

Opening of the St. Clair Tunnel.

The Grand Trunk tunnel under the St. Clair River at Sarnia will be formally opened on Saturday, Sept. 19. The opening ceremonies are expected to be of a brilliant character. Sarnia on the Canadian side, and Port Huron on the American side, will give up the whole day to enjoyment and celebration. The arrangements now being made for the opening include a banquet in the tunnel, at which President Harrison, many governors of states, the Governor-General of Canada, Sir Henry Tyler, President of the Grand Trunk Railway, and other Grand Trunk officials, will be present. The tables will be laid on the boundary line, and during the entertainment and banquet the Thirteenth Battalion Band, of Hamilton, will play a programme of music. On the Canadian side the band will play "God Save the Queen," and on the American side "The Star Spangled Banner."

Further Facts about the Brooks Compound.

The Brooks Locomotive Works, Dunkirk, N. Y., have just built their first compound locomotive, and it is now running on the Lake Shore road. The engine is a mogul with one large and one small cylinder, intended for freight service. The cylinders are 16 and 28 x 24. The engine weighs 95,000 lbs. and is intended to pull 50 cars between Buffalo and Erie. The drivers are 5 ft. in diameter. The engine has both steam and air brake apparatus. This engine has a new intercepting valve arrangement, and will be thoroughly tested to determine the correctness of the proportions of the cylinders to the weight.

The Harvard Bridge.

The Harvard Bridge, connecting Boston and Cambridge, which was substantially completed a year and a half ago, but which has remained unused in consequence of the litigation concerning the approach at the Cambridge end, was opened to the public on the morning of Sept. 1. The bridge was built by the cities of Boston and Cambridge, and the northern end being located close to the track of the Grand Junction branch of the Boston & Albany railroad either a dangerous grade crossing or an expensive bridge over the railroad became necessary. After extended litigation the Supreme Court decided that the street might cross the railroad at grade, overruling the decision of the State Railroad Commissioners. This bridge is 2,157 ft. long, 70 ft. wide and 14 ft. above high water. There is a draw 135 ft. long which will be operated by electricity. The style of the bridge is plate girder. The tracks of the West End Street Railroad have been laid across the bridge, and these will be used for running the electric cars.

The Nicaragua Canal.

The pier at Greytown has been extended 1,030 ft., and the dredging of the channels is continued. Progress is also making in the construction of telegraph and railroad lines and buildings. Excavation has been carried to a depth of 17 ft. for half a mile and the right of way is cleared for 10 miles. The force of men employed has been somewhat reduced.

The Hennepin Canal.

On Aug. 28 condemnation proceedings were entered in the United States District Court at Peoria, Ill., against 50 or more property owners in Rock Island County, the object being to secure right of way for the Hennepin Canal. Most of this land is used for farming purposes.

THE SCRAP HEAP.

Notes.

At Samuels, Tex., on the Southern Pacific, Sept. 1, six masked robbers stopped a train and robbed it of all the valuables in the express car, and also some registered mail matter. They used dynamite to tear open the car, and having a strong force, worked with deliberation.

In the court at Atlanta last week, Judge Clark decided the injunction case brought by the railroad companies to enjoin the Comptroller General of Georgia from collecting county taxes from railroad companies, under the statute passed by the last Legislature. The Court decided against the railroads and in favor of the State. The amounts involved are large, and the case will doubtless be appealed.

The Chicago *Inter-Ocean*, after much inquiry, is satisfied that the long pending negotiations between the Baltimore & Ohio and the Chicago & Northern Pacific (Wisconsin Central) for the use by the former of the elegant new station of the latter in Chicago, have been practically settled, and that the passenger trains of the Baltimore & Ohio will run to and from that station before Nov. 1. An arrangement by which the Wisconsin Central trains can run directly to the grounds of the proposed World's Fair is included in the agreement.

Newspaper contests are the rage down South, and so the *Texas Live Stock Journal*, not to be outdone by the dailies, offers a unique prize. It says: The *Journal* must keep up with the procession, and as it would be a little out of line to undertake to educate all the pretty girls in the country, we propose to furnish transportation and pay all expenses to the Holy Land for the railroad live stock agent who has, during the past season, been the most economical with the truth; the contest to be decided in the usual way. Candidates will be restricted to the range country of the Southwest, which includes Texas, Indian Territory, New Mexico and Colorado.

New Stations and Shops.

The Wheeling & Lake Erie will soon build new machine shops at Toledo, O.

The plans for the new passenger station to be built for the Lehigh Valley in Buffalo have been drawn and submitted to the contractors for bids. The details of the construction of the building have not been made public, but the station will probably front on Washington street, the train shed extending 400 ft. along Scott street. The station building will probably be built of brick and will be two stories high with a tower on Washington street.

The Illinois Central has completed the plans and specifications for the station which is to be built in New Orleans. The building will be about 175 ft. long, 30 ft. wide and two stories high. The upper floor will be used for offices.

The Philadelphia & Reading is to build at Hazleton Junction, on the Delaware, Susquehanna & Schuylkill division, a scale 125 ft. in length and having a weighing capacity of 200 tons. The location is on the line over which will be carried the coal from the new territory lately acquired. About 16 tons of castings and 22,000 ft. of lumber will be used in its construction.

The Baltimore & Ohio will build a new passenger station at Washington, Pa., to cost about \$15,000. It will be a combination of stone and wood.

Narrow Gauge Roads in India.

Sir Edward Watkin, speaking of his observations on a recent trip to India, says that in Kettiwar there are 334 miles of metre gauge railroad, in Rajpucana and Central India 2,008 miles, in Oudh 278 miles, and in Bengal 1,145 miles. These lines constitute four distinct and unconnected groups; they have cost £20,000,000 sterling and yet fail to afford the full advantages obtainable from them because they are not connected. A third rail on one line of 39 miles, another of 45 miles, and still another of 39 miles, on existing standard gauge roads, would connect all these systems. These connections could be made for about £200,000, and the improvement, Sir Edward thinks, would at once enormously increase the effective value of the roads. About 400,000 square miles of territory in northern India is served exclusively by these narrow gauge roads, and Sir Edward thinks that the question of food distribution, especially in view of the partial failure of crops this year, makes the question of building these connections one of pressing importance.

Technical Schools.

The Rhode Island Technical Drawing School has issued its annual circular of information, comprising a description of the courses of instruction, programme of studies, experimental apparatus, list of shops visited, and names of instructors.

The University of Wisconsin announces an increase in the force of instructors in the College of Mechanics and Engineering and enlarged facilities. Three new chairs have been added, namely, Railroad Engineering, Electrical Engineering and Machine Design. The title of Professor of Civil Engineering has been dropped and instruction in that branch specialized, as suggested above, and by the addition of a professorship of Bridge and Hydraulic Engineering. The college has engineering, electrical and chemical laboratories. For residents of the State of Wisconsin the tuition is free, for non-residents six dollars a term. The general expenses are very low.

Train Robbery in Colorado.

An express train was stopped and robbed by seven men at Cotopaxi, on the line of the Denver & Rio Grande, on the night of Aug. 31. The robbers forced a watchman to stop the train. The fireman was then compelled to break open the door of the baggage car in the face of the fire from the express messenger's revolver. The messenger was compelled to open the safe and \$3,000 was secured. The passengers were not molested. Posses are out in pursuit.

Some Things that Are Not So.

A story has gone around several of our contemporaries to the effect that arrangements are making at the Pennsylvania shops at Altoona to build a locomotive in 12 hours. It is to be a heavy mogul, with from 10 to 20 driving wheels, and to run on the Chicago Limited. We have excellent authority for saying that there is no truth in this story.

Other enterprising contemporaries have given circulation to the story that the Chicago, Milwaukee & St. Paul has contrived a mysterious locomotive to burn its own smoke, one of the peculiarities being that it has no smokestack whatever. We are authorized to state that this engine has neither smokestack, nor boiler, nor cylinders, nor driving wheels.

The Statesville Disaster.

Westbound passenger train No. 9, on the Western North Carolina division of the Richmond & Danville, was derailed near a bridge two miles west of Statesville, N. C., about 2 o'clock on the morning of Aug. 27, and the whole train was overturned and fell about 80 ft. to the valley below, making a terrible wreck. The bridge, which spans Third Creek, is known as Bastian's Bridge, and is a modern iron structure. There were 85 passengers in the train, and all but a very few were either instantly killed or badly injured. The latest reports indicate that 15 passengers and 4 trainmen were killed, and 15 passengers and 2 trainmen badly injured. The water was dammed by the wreck and some of the victims were drowned. Most of the cars ran upon the bridge before they were overturned, but the bridge was not materially injured and traffic on the line was not interrupted. A coroner's jury, after four days' investigation, found that the wrecking of the train was caused by a loose rail, the bolts and spikes of the same having been taken out by some person or persons unknown to the jury, with tools belonging to the railroad company "left by the gross negligence of the railroad company" in an open shed accessible to everybody. The jury also say that several ties near where the rail was removed, were unsound, and that the "superstructure of the track" was in part defective. The high rate of speed maintained in going over the bridge is also condemned.

Reconnaissances in South America.

Lord Donoughmore and associates have two parties of engineers making surveys on the river Desaguadero, in the eastern part of Peru and Bolivia, for the purpose of discovering whether the river is navigable. They have already secured data to show that it can be made so at a small cost. This stream will afford to Bolivia an easy exit to the sea by the Amazon. The construction of a railroad from the point at which the river ceases to be navigable to La Paz, the capital of Bolivia, is also under consideration.

Four Persons Killed at Tell City, Ind.

Four passengers were killed and ten seriously hurt in a wreck on the Tell City branch of the Louisville, Evansville & St. Louis, near Tell City, on Monday last. A mixed train jumped the track and rolled over a high embankment. The wreck caught fire almost immediately and escaping steam from the locomotive poured in upon the imprisoned passengers. It is said that a broken flange on one of the front truck wheels of the locomotive caused the derailment. The engineer and fireman were badly scalded.

Fuel on Indian Railroads.

The administration report on Indian railways shows a marked advance in the use of Indian coal as fuel and consequent falling off in the use of English coal and patent fuel. In many cases the coal supply is so far removed from the railroad lines as to make English coal the cheaper, but the rapid extension of the local collieries and a constantly increasing output give rise to the hope that Indian coal will eventually be used on all her railroads.

The supply of petroleum from the Khattian oil works to the Chaman Extension railway was smaller during the year under review than during the previous year, owing to underground flow of water gaining access to the wells. Owing to the distance of Khattian from the railroad, the government has begun drilling at Spintangl. At Digboi a free flow of oil was obtained at a depth of 650 ft., and the oil is said to have a good color and as high a flashing point as the usual grade of American and Russian petroleum now being imported into the market.

The International Railroad Congress.

We announced recently that it was expected that the presidency of this body would be offered to M. Alfred Picard, Inspector-General of Bridges and Highways, but M. Picard has positively declined to accept the nomination. It seems probable now that the presidency will be offered to one of the Belgian members of the Congress, as it is desirable to prevent international jealousies, which it is supposed would arise if the president were a Frenchman.

An Illinois Central-Michigan Central Station for Chicago.

A Chicago dispatch of the 2d says: A new passenger station at the foot of Lake street in time for the World's Fair is now assured. President H. B. Ledyard, of the Michigan Central, Chief Engineer Hawks and General Superintendent Miller spent the entire day yesterday in conference with Illinois Central officials over the plans of the proposed structure. Before President Ledyard left here for the East last evening a definite understanding had been reached, and work will be begun just as soon as the rough draught of the plans decided on can be reduced to proper form. The building to be put up will cost some \$500,000. The Illinois Central hopes ultimately to get the block on the lake-front between Randolph and Madison streets. Should it find itself unable to come to any terms with the city for this property, it then proposes to build a grand passenger station on its property at the foot of Twelfth street, and the building now to be constructed will then be utilized as a freight house.

New York & New Jersey Bridge Co.

A meeting of the New York directors of the company, incorporated in New York to build the proposed bridge across the Hudson River at New York City, was held in New York this week to effect a temporary organization and to consider a proposed plan of consolidation with the New Jersey corporation. The following were elected: President, John B. Kerr, of the New York, Ontario & Western R. R.; Vice-President, George W. Greene; Secretary and Treasurer, Charles H. Swan; Chief Engineer, Thomas C. Clarke. The terms and detailed plans for consolidating this company with the New Jersey company have been matured. It has been agreed that the construction of the land piers should begin immediately after the consolidation has been effected, there being sufficient funds available to start this work. Secretary Swan states that the company will certainly begin constructing the land piers soon.

The New Jersey directors met last Wednesday and elected the following officers: Henry M. Haar, President; James T. Sparkman, Vice-President; William Foster, Treasurer; Frederick E. Culver, Secretary; Clark & Culver, Counsel, and Delos E. Culver, Chief Engineer. These, with John C. De La Vergne, Edward P. Fowler, William D. Edwards, Bird W. Spencer, William E. Bumstead, R. Floyd Clark, Charles A. Stadler, and Charles A. Fox, constitute the directors of the company.

LOCOMOTIVE BUILDING.

The Canadian Pacific has just received 12 new 10-wheel locomotives, with cylinders 18 x 24 in., for service on the Ontario and Atlantic Division.

The Seaboard Air Line has placed an order with the Richmond Locomotive Works, of Richmond, Va., for four passenger engines, with cylinders 18 x 24 in.

The Norfolk & Western has just received 10 new locomotives from the Baldwin Locomotive Works, Philadelphia, and 10 from the Rogers Works, at Paterson, N. J.

It is said that the Southern Pacific (Atlantic system) has ordered from the Schenectady Locomotive Works five compound locomotives, one for freight and four for passenger service. One compound is already in use on the Texas lines of the road.

The Illinois Central has let contracts for 20 consolidation engines with boilers of the Belpaire type, 62 in. in diameter, made of Otis steel. The fire-boxes are 121 x 33½ in., and have a brick arch resting on 2 in. tubes which extend from the tube sheet to the back sheet. There are 236 tubes, 2 in. outside diameter and 12 ft. long. The cylinders are 21 x 24 in. The drivers are 50½ in. in diameter, with 3¼ in. Krupp tires. The guides and crossheads are of the Laird type. The piston heads are of the box pattern without followers. The stack is tapered on the outside and 16 in. diameter, straight, inside. The piston rods, crank pins and crossheads, are of steel. The boilers will carry 165 lbs. pressure per sq. in. The tenders have a water capacity of 3,850 gallons, and are furnished with 36 in. double plate Washburne wheels.

The Chicago & South Side Rapid Transit Railroad Co. is in the market for 25 engines and 75 cars. The specifications and drawings for the locomotives have been sent to all prominent locomotive builders, and bids have been asked for a November delivery. The engines will probably all be made compound, with either two or four cylinders, according to the merits of the designs presented and the prices offered. Regarding the compound system, the company stands equally in favor of two or four cylinders, and will throw the entire responsibility of the action of the locomotives upon the builders, and a guaranty will be asked to secure the company against any failure in performance. However, the builders are not asked to guarantee the efficiency or the saving, but only to guarantee the successful operation of the mechanism under the conditions of elevated railroad traffic. What the company does ask for is that the engines shall make as little noise as possible in starting trains, and this it expects to get from any system of compounding which does not contemplate the admission of live steam at boiler pressure to both cylinders with a separate exhaust from both cylinders. It is expected that with the compound system there will be no need of a muffler in the exhaust pipe.

The engines are to weigh 50,000 lbs., with not less than 40,000 lbs. on the drivers. If any simple engines are built the cylinders will be 13 in. in diameter by 16 in. stroke; the boilers will carry 180 lbs. steam pressure. If the engines are compounded with two cylinders, the sizes will be 14 and 22 x 16 in. stroke. If with four cylinders, the sizes will be made to be equivalent to those just mentioned. The boilers will be of the Belpaire radial stay extended wagon top type, with large fireboxes and steam spaces. The cabs are to be of steel, of new design. The frames are of wrought iron, all in one piece from end to end, instead of in two parts as on the New York elevated engines. The Allen-Richardson valve will be used and the ports will be 14 and 16 in. in length and the valve travel 6 in. The object of these proportions is to obtain a locomotive which will have an increased starting power and a large mean effective pressure when a speed of 30 miles per hour has been reached. This is necessitated by the frequent stops and a demand for an average speed over the entire line of 15 miles per hour. It is not true that these engines have been contracted for, as recently stated by a contemporary.

CAR BUILDING.

The Huntingdon & Broad Top Mountain has closed a contract for 100 thirty-ton hopper gondola coal cars to be delivered in October.

The Evansville & Terre Haute is reported to be in the market for 500 coal cars and 400 box cars.

The Baltimore & Ohio has ordered 500 new box cars for use on the Central States Despatch Line.

The Michigan Car Works, at Detroit, Mich., are completing an order of 500 box cars placed by the Toledo, St. Louis & Kansas City early in July and delivering them at the rate of 20 a day.

The Southern Pacific is building at its Algiers (La.) shops 300 new platform cars 36 ft. long and of 30 tons capacity.

The East Tennessee Virginia, & Georgia has let a contract for building 18 passenger cars to the Barney & Smith Manufacturing Co., of Dayton, O. The cars will be equipped with the Barr vestibule.

The Mobile & Ohio shops at Whistler, Ala., have just turned out a new refrigerator and ventilator fruit car. The car is of the Carson & Gurganus pattern. It can be thrown into a refrigerator car in winter time, and into a ventilator in summer. It is claimed that when arranged as a ventilator car it is 10 degrees cooler than other cars. The car will be given a test by being sent to Cincinnati loaded with bananas.

The Chicago & South Side Rapid Transit Railroad Co. is in the market for 75 suburban coaches. The plans call for cars similar to those on the Manhattan Elevated, though they have wider platforms at the ends in order that two persons may go out abreast, and double doors which are opened simultaneously by the attendant on the platform. They are to have cane seats and have a plain, neat finish. The trucks will be of steel, not unlike those used on the Manhattan road, but they will have larger journals and be somewhat stronger.

BRIDGE BUILDING.

Antrim, N. H.—An iron bridge is to be built across the Contoocook River between Antrim and Bennington.

Belleville, Ont.—A steel bridge has recently been constructed, at a cost of \$93,000, spanning the Bay of Quinte at Belleville and joining the counties of Prince Edward and Hastings at that point. The superstructure was built by the G. & J. Browne Manufacturing Co., of Belleville, for \$38,500. The design was also furnished by them, and is a single intersection through span. The length of the bridge and the approaches is 2,913 ft., and it is said to be the longest highway bridge in Canada. The bridge has 13 spans of 98 ft. each, two spans of 148 ft. each, one draw span of 238 ft., and one span of 63 ft. at the south end. The northern approach

(embankment) is 3,616 ft. in length, made of material dredged from the bay. This embankment has a width of 30 ft. at the top, and its sides are riprapped to 4 ft. below the water level. The total length of the bridge and its approaches is 5,787 ft.

Brazoria, Tex.—The County Judge of Brazoria County, Tex., will receive bids until Sept. 11 for the construction of an iron drawbridge to be built across the Bernard River. The river is 232 ft. wide and 14½ ft. deep.

Cleveland, O.—The City Council proposes to make changes in the grades of several of the streets in Cleveland, and will probably require the New York, Chicago & St. Louis to build bridges over the tracks at Kinsman street and Wilson avenue. The crossings at these streets are near the foot of steep hills.

Hendricks, W. Va.—A new steel highway bridge is to be erected over Blackbork River at Hendricks.

Marriottsville, Md.—The King Iron Bridge Co., of Cleveland, O., has been awarded the contract at \$1,875 for building a joint county bridge over the Patapsco River at this place. The structure will be an iron Pratt truss with a span of 93 ft., and a roadway 16 ft. wide.

Minneapolis, Minn.—The contract for the construction of a stone arch bridge over the Minnehaha Creek, on Lyndale avenue, the bids for which were referred to the committee on roads and bridges, has been awarded to Charles Stone for about \$6,000.

Ontonagon, Mich.—The King Iron Bridge Co., of Cleveland, O., has been awarded the contract for constructing an iron bridge over the Ontonagon River at this place.

Pittsburgh, Pa.—The plans presented by the Upper Bridge Co. for the construction of a bridge 58 ft. high and 370 ft. wide in the clear across the Monongahela River at Pittsburgh, have been approved by the War Department.

Plainfield, N. J.—At a recent meeting of the Board of Freeholders of Middlesex County the project to erect a new bridge at Albany street was voted down.

Prairie Lea, Tex.—The Commissioners' Court of Caldwell County has let the contract for building an iron bridge, 620 ft. long, across the San Marcos River at Prairie Lea to the Groton Iron Bridge Co., at \$4,730. The bridge must be completed in 90 days from the date of contract.

Red Sulphur Springs, W. Va.—It is stated that the Monroe County Court has appropriated a sum for the construction of an iron bridge across Indian Creek at this place.

Rosemont, Pa.—The Pennsylvania road has begun the construction of a stone arch under-bridge at Rosemont. It will be 105 ft. long, about 20 ft. high and 24 ft. wide.

Saginaw, Mich.—The Common Council has decided to issue bonds to the amount of \$200,000 for the erection of two bridges.

Seranton, Pa.—The Select Council has rejected all bids for the superstructure of the Market street bridge, on the ground that they were higher than the estimate of the City Engineer. The bids for the abutments were under the estimate of \$4,500, and these were referred to a committee, with instructions to award the contract to the lowest bidder.

Sioux City, Ia.—There seems to be at last a good prospect that the long proposed viaduct on lower Fourth street to Howard street, over the tracks of the Chicago, St. Paul, Minneapolis & Omaha and the Dubuque & Sioux City, will be built. The railroad engineers and the City Council committee have agreed upon plans which provide for a structure 50 ft. wide, as desired by the city, but the amount in excess of the cost of building a viaduct 42 ft. wide is to be borne by the city. The City Council will soon vote on the ordinance which has been drafted.

Spokane, Wash.—The City Commissioners have awarded the San Francisco Bridge Co. the contract for building the Division street bridge.

Springfield, Mass.—The contract for building the bridge over the tracks of the Connecticut River road on Plainfield street has been awarded to the R. F. Hawkins Iron Works at \$9,000.

Trenton, N. J.—At a meeting of the Board of Freeholders held last week it was decided to communicate with the Pennsylvania road and see what it is willing to do toward building a bridge at the Hermitage.

Utica, N. Y.—The Superintendent of Public Works at Albany has awarded contracts for the erection of a bridge over the canal at Schuyler street, Utica. The substructure work was awarded to F. Lewis, Faas & Co., of Utica, at \$1,579.75, and the superstructure work to W. A. Shepherd & Sons, of Havana, N. Y., at \$1,900.

Wheeling, W. Va.—The Baltimore & Ohio is putting new stone abutments under its iron bridge over Wheeling Creek.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In Texas the Supreme Court rules that a railroad is not liable to the statutory penalty for detaining freight after payment or tender of the charges as shown by the bill of lading, when the freight is detained by a connecting line to which it has been delivered together with the way bill.¹

In the same state it is held that under the statute prescribing a penalty of \$500 against any railroad company exacting higher rates of freight than the maximum rates fixed, a company which receives freight and delivers it to a connecting carrier is not liable to the penalty because of an overcharge by the latter company.²

In Indiana it is held by the Supreme Court that a contract of shipment is not rendered illegal by the single fact that the carrier gives the shipper a special rate, to be carried into effect by means of a rebate; and in order to defeat the shipper's action for the rebate the carrier must show that the special rate is an unjust, unfair, or oppressive discrimination in favor of the shipper against the general public.³

In the same case it is ruled that a pooling arrangement entered into between rival railroad companies fixing freight rates is *prima facie* illegal; and one of the companies which agreed to give a shipper a rebate, in violation of the pooling contract, must affirmatively show that the pool was formed to prevent ruinous competition, and not to establish unreasonable rates, unjust

discrimination, or oppressive regulations, before it can rely on the shipper's knowledge of the pool rates as a defense to an action for the rebate.³

In Mississippi appellee agreed to ship a "jack" and four mules over appellant's line in a box car if the doorway thereto was slatted and not closed. As the train was leaving appellee signed a special contract containing this clause: "And the said party of the second part having examined the same hereby accepts for such transportation the cars provided . . . and assumes all risk . . . in consequence of suffocation or other ill effects of being crowded in the cars." The car doors were not slatted, and the jack died from suffocation in consequence thereof. The Supreme Court holds that the acceptance of the box car by the shipper went no further than the acceptance of one with an open door properly slatted, and that suffocation for want of ventilation was not one of the risks assumed when the shipper signed the contract.⁴

In Minnesota plaintiff delivered live stock to defendant railroad company for transportation to S. under a contract which provided that plaintiff should load and unload the stock; feed, water and attend the stock at his own expense and risk and keep the same securely fastened. The car containing the stock arrived at S. in the night and was placed on a side track, and plaintiff, after an absence of a few minutes returned to the car and lay down in it. The Supreme Court rules that although plaintiff had ceased to be a passenger, yet if a prudent attention to the stock required him to remain in the car—and of this the jury was to be the judge—defendant was bound to exercise care to avoid injuring plaintiff while he was so in the car.⁵

In Missouri the Supreme Court rules that where it is shown that the cars were running on defendant's track when wrecked, it will be presumed, in the absence of evidence to the contrary, that they were operated by defendant. And it is also ruled that where the injury was caused by cars jumping the track and demolishing the house in which plaintiffs' intestate was sleeping, the jury is warranted in finding that the injury was due to the excessive speed of the train, though there is no direct evidence that such speed was the cause of the cars leaving the track in the first instance.⁷

In New York an action to restrain the maintenance of a railroad in front of certain property was brought by one having a leasehold estate therein, with a contingent right of renewal. The Supreme Court holds that a perpetual injunction should not be granted; the restraint should be only during the subsistence of plaintiff's interest.⁸

In New York the Supreme Court rules that a railroad may institute proceedings to condemn land after the road has been constructed; and it is no bar to such proceeding that the land owner has recovered judgment in an action theretofore brought against the company for damages and an injunction.⁹

In New York the Supreme Court decides that the construction of a place for the storage of the boats of passengers visiting a watering place on the line of petitioner's railroad is not for railroad purposes, and land therefor cannot be taken under the right of eminent domain. A railroad company cannot condemn land for the purpose of opening a highway from its road to a hotel a third of a mile distant, as the place for the entertainment of its patrons. Land cannot be condemned for the purpose of draining an adjacent tract through it, where it appears that the owner of the land sought to be drained can construct the drains through his own land with but little less convenience, and at but little more expense than through the land sought to be condemned.¹⁰

Injuries to Passengers, Employees and Strangers.

In Massachusetts the Supreme Court holds that a rule of the company forbidding the carrying of passengers on freight trains, is infringed by the carrying of one from whom no fare is expected or collected.¹¹

In Texas the Supreme Court rules that while the duty of the carrier to all passengers is the same in degree, the amount of care may vary with the age, sex, or bodily infirmity of the passenger, and the carrier is not entitled to a charge that it owes no greater duty to a female passenger than to a male one.¹²

In New York the Supreme Court holds that when a passenger, while passing from the smoking car, where he went to smoke, to his seat on another coach on a moving train, is thrown off by the breaking of the coupling between two cars, caused by the negligence of the railroad company, the company is liable.¹³

In Iowa the Supreme Court rules that a yardmaster, though he has no authority to order the yard-engines to be repaired, but must report complaints to the trainmaster, who has authority as to such matters, is the proper person to whom a brakeman working on a defective switch-engine should make complaint.¹⁴

In Virginia the deceased, who was an experienced yard brakeman, was employed in defendant's yard to uncouple cars; on a dark night the yard-master directed him to uncouple cars, which were standing still, and then ride them back on a switch, but, instead of doing so, he signaled the engineer to back, and, stepping between the moving cars to uncouple them, was killed. The Court of Appeals rules that he was negligent and the railroad not liable.¹⁵

In North Dakota the Supreme Court holds that the negligence of the foreman of a gang of railroad hands in failing to block a pile which was shoved against plaintiff, injuring him, because it was not blocked, is the negligence of a fellow-servant, although the foreman had authority to employ and discharge plaintiff, and the plaintiff was under his superintendence and control in doing the work in the performance of which he was injured; for the matter in regard to which the foreman was negligent was the work of a servant, and not the performance of a duty which the master owed to his employees.¹⁶

In Missouri, in an action against a railroad company for injuries to an employee, it was shown that S. was in charge of defendant's round-house, and had control and direction of the men employed therein, of whom plaintiff was one. S. ordered plaintiff to shovel the ashes out of the pit under the track on which an engine was standing. While plaintiff was engaged in this work S. moved the engine back without giving any warning that he was about to do so, and plaintiff's ankle was crushed before he could get out of the way. The Supreme Court holds that S. was not a fellow-servant of plaintiff, and defendant is liable.¹⁷

In Louisiana a railroad company owning a short line, received all its cars from another company and had no car inspector, it being the duty of the conductor to inspect the cars. The engineer was at times called on to do other work than that belonging to his charge, and was ordered to obey the conductor. The latter requested the engineer to take his place in making up the train; while doing so the engineer tried to make a coupling and was injured by reason of a defective drawhead. The Supreme Court rules that the company was liable.¹⁸

In Tennessee the Supreme Court rules that it is error to charge that, for the protection of employees in its shops a railroad company is bound to have its machinery "safe, so far as human skill and foresight can make it."¹⁵

In New York the Supreme Court holds that the omission of a railroad company to have the headlight on its engine lighted at about dusk, will not warrant a recovery for the death of one run over by the engine at a crossing where the engine and cars, as well as the reflection of the lights from the car windows, were distinctly visible to persons near the crossing. Reversing 7 N. Y. S. 725.²⁰

- ¹ G. C. & S. F. Ry. Co. v. Adair, 14 S. W. Rep., 1076.
- ² G. C. & S. F. Ry. Co. v. Adair, 14 S. W. Rep., 1076.
- ³ C. C. & I. Ry. Co. v. Closser, 26 N. E. Rep., 159.
- ⁴ C. C. & I. Ry. Co. v. Closser, 26 N. E. Rep., 159.
- ⁵ Kansas City M. & B. R. Co. v. Holland, 8 South Rep., 516.
- ⁶ Orcutt v. Northern Pac. R. Co., 47 N. W. Rep., 1,063.
- ⁷ Walsh v. M. P. Ry. Co., 14 S. W. Rep., 873.
- ⁸ Welsh v. N. Y. El. R. Co., 12 N. Y. S., 545.
- ⁹ The Metropolitan Con. R. Co., 12 N. Y. S., 506.
- ¹⁰ In re Rochester & G. H. R. Co., 12 N. Y. S., 566.
- ¹¹ Powers v. B. & M. R. Co., 26 N. E. Rep., 446.
- ¹² St. Louis, A. & T. Ry. Co. v. Finley, 15 S. W. Rep., 266.
- ¹³ Costikyan v. R. W. & O. R. Co., 12 N. Y. S., 633.
- ¹⁴ Peart v. C. R. L. & P. Ry. Co., 47 N. W. Rep., 1,017.
- ¹⁵ R. & D. R. Co. v. Risdon, 12 S. E. Rep., 786.
- ¹⁶ Ell v. N. P. R. Co., 48 N. W. Rep., 222.
- ¹⁷ Dayharsh v. H. & St. J. R. Co., 15 S. W. Rep., 551.
- ¹⁸ Homar v. Louisiana, N. & S. R. Co., 8 South Rep., 478.
- ¹⁹ East Tenn. V. & G. R. Co. v. Aiken, 14 S. W. Rep., 1,082.
- ²⁰ Daniels v. Staten Island R. R. Co., 26 N. E. Rep., 468.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Atlanta & Charlotte Air Line, semi-annual, 3 per cent., payable Sept. 5.
- Chicago & Eastern Illinois, quarterly, 1½ per cent. on the preferred stock.
- Delaware & Hudson Canal Co., quarterly, 1¼ per cent., payable Sept. 15.
- Northern Pacific, quarterly, 1 per cent. on the preferred stock, payable Oct. 15.
- West Jersey, semi-annual, 3¼ per cent., payable Sept. 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Boston & Albany, annual, Boston, Mass., Sept. 23.
- Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 16.
- Chicago, Detroit & Canada Grand Trunk Junction, annual, Detroit, Mich., Sept. 30.
- Connecticut River, annual, Springfield, Mass., Sept. 16.
- Detroit & St. Clair River, special, St. Clair, Mich., Sept. 15.
- Erie & Huron, annual, Toronto, Ont., Sept. 8.
- Fitchburg, annual, Boston, Mass., Sept. 30.
- Michigan Air Line, annual, Detroit, Mich., Sept. 30.
- Minneapolis, St. Paul & Sault Ste. Marie, annual, Minneapolis, Minn., Sept. 16.
- Montreal & Ottawa, special, Montreal, P. Que., Sept. 20.
- Nashville, Chattanooga & St. Louis, annual, Nashville, Tenn., Sept. 9.
- New York, Ontario & Western, annual, 18 Exchange Place, New York City, Sept. 30.
- New York, Providence & Boston, annual, Providence, R. I., Sept. 9.
- Ohio, Indiana & Western, annual, Indianapolis, Ind., Sept. 8.
- Old Colony, annual, Boston, Mass., Sept. 20.
- Pearson Coal, Iron & Railroad Company, special, Birmingham, Ala., Sept. 10, to consider a proposed issue of bonds.
- St. Johnsbury & Lake Champlain, annual, St. Johnsbury, Vt., Sept. 10.
- South Atlantic & Ohio, annual, Bristol, Va., (and Tennessee), Sept. 9.
- Toledo & Ohio Central, annual, Toledo, O., Sept. 7.
- Wabash, annual, St. Louis, Mo., Sept. 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The International Association of Ticket Agents will hold its next annual meeting at St. Paul, Minn., Sept. 7.
- The Roadmasters' Association of America will hold its next annual convention at the West Hotel, Minneapolis, Minn., Sept. 8, 9 and 10.
- The Master Car and Locomotive Painters' Association will hold its twenty-second annual convention at the Arlington Hotel, Washington, D. C., Sept. 9, 10 and 11.
- The American Association of General Passenger and Ticket Agents will hold its next annual convention at Old Point Comfort, Va., Sept. 15.
- The American Association of Railroad Clerks will hold its second national convention at St. Louis, Mo., beginning Sept. 16.
- The International Brotherhood of Railway Conductors will hold its third annual convention at Louisville, Ky., Sept. 21.
- The New England Railroad Club meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.
- The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.
- The New York Railroad Club will hold its next meeting at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in September.
- The Southern Railway Club holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.
- The Central Railway Club meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.
- The Northwest Railroad Club meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.
- The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.
- The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street New York

The Boston Society of Civil Engineers holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The Engineers' Club of St. Louis holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The Engineers' Society of Western Pennsylvania hold regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The Civil Engineers' Club of Cleveland holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the South holds its monthly meetings on the second Thursdays at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers and Architects holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas hold regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The Engineers' Club of Minneapolis meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The Canadian Society of Civil Engineers holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The Association of Civil Engineers of Dallas meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The Engineers' Club of Minneapolis meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The Canadian Society of Civil Engineers holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The Technical Society of the Pacific Coast holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

New England Railroad Club.

The season will open with an excursion to Crescent Park, R. I., where dinner will be served, after which a steamboat excursion will be had on Narragansett Bay. A special train will leave Park Square Station of the Old Colony on Wednesday, Sept. 9, 1891, at 9 o'clock a. m. Dinner will be served at Crescent Park at 12 o'clock m. Returning, train will leave at 5 p. m. The trains will stop at Mansfield and East Providence only.

PERSONAL.

—Mr. R. G. Butler, of the Wabash road, has been elected President of the Michigan Passenger Association, of which he has for some time been Secretary and Treasurer.

—Mr. J. W. Torrence has resigned as Master Mechanic of the Ohio Valley at De Korven, Ky., as the road has decided to remove the shops from that place to Paducah, Ky.

—Mr. L. H. Plues has resigned as General Baggage Agent of the Flint & Pere Marquette, and that office has been abolished. Mr. Plues has held the position about 10 years.

—Mr. John F. Hager, State Railroad Commissioner of Kentucky, has resigned and has been succeeded in that office by Mr. Matthew Adams, the Secretary of State of Kentucky.

—Mr. Charles F. Ludlum, at one time Traveling Passenger Agent of the Gulf, Colorado & Santa Fe, with headquarters at Temple, Tex., died recently at Nashville, Tenn., aged 37 years.

—Colonel Thomas R. Bonner, for the past two years one of the Receivers of the International & Great Northern, and senior member of the banking house of Bonner & Bonner, died at his home in Tyler, Tex., Aug. 30, at the age of 43 years.

—Mr. James W. Murphy has been placed in charge of the claim department of (a bureau the legal department) of the Wisconsin Central, succeeding Mr. C. A. Herriman. Mr. Murphy has been a United States Post Office Inspector.

—Mr. E. T. McConnell, Engineer of Maintenance of Way on the Peoria & Eastern Division of the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis, Ind., has been elected a junior member of the American Society of Civil Engineers.

—Mr. George C. Smith, formerly Chief Engineer of the Chicago, Burlington & Quincy, who went to South America two years ago to take charge of the engineering interests of Baring Brothers in the Argentine Republic and adjoining states, has returned to this country, and is now in Chicago.

—Mr. Enoch F. Sweatt, a railroad contractor for the past 40 years, died at his home in Woonsocket, R. I., Sept. 1, aged 69 years. In 1889 and '90 he was General Manager of the Upper Coos road, now a part of the Maine Central. At the time of his death he was President of the Woonsocket Machine & Press Co. and a Director of the Woonsocket & Pascoag Railroad Co.

—Mr. Elias H. Williams, builder of the road extending from Dubuque, Ia., to St. Paul, Minn., now owned by the Chicago, Milwaukee & St. Paul, and the old Iowa Eastern from McGregor to Elkader, Ia., died at his country home in Clayton County, Ia., Aug. 20, at the age of 72.

—Mr. Charles F. Stowell, Bridge Engineer of the New York State Railroad Commission, has opened an office as a consulting engineer in Albany. He will give special attention to the design of bridges and roofs, inspection of structural iron and steel, and superintendence of construction or repairs of bridges and buildings.

—Mr. Joseph A. Steltenkamp, Assistant Passenger Agent of the Louisville & Nashville at Louisville, Ky., has been promoted to the position of Traveling Passenger Agent of the road, with headquarters at Indianapolis, Ind. Mr. Steltenkamp has been in the employ of the company since 1883, and was for six years engaged in the general passenger office.

—Mr. A. W. Gibbs, Assistant Superintendent of Motive Power of the Richmond & Danville, has resigned and the office has been abolished. Mr. Gibbs was formerly Superintendent of Motive Power of the Central of Georgia, but when that line was leased to the Richmond & Danville his title was changed. It is expected that he will continue in the service of the mechanical department of the latter road.

—Mr. John Erbeling, a civil engineer, lately employed on the Long Island road, died recently at Brooklyn, N. Y., at the age of 65. He was born in Bavaria, and was engaged in the construction of several railroads in France and Switzerland, until the Franco-Prussian war, when he came to this country and was employed on the Calumet copper mines in northern Michigan, and later on the Long Island Railroad.

—Hon. Chester D. Hubbard, President of the Pittsburgh, Wheeling & Kentucky Railroad, died at his home in Wheeling, W. Va., Aug. 23, at the age of 77 years. For the past two years he has been unable to discharge all his official duties, and two months ago left for Martha's Vineyard in the hope that the change of climate would benefit him, but finding this failed he returned home, where he died the next day. It was mainly through the efforts of General Hubbard that the above road was built. He was a member of the 39th and 40th Congresses.

—Mr. S. T. Smith, General Manager of the Denver & Rio Grande, has resigned, for reasons similar to those which led to the resignation of the president, Mr. D. H. Moffat, the curtailment of the authority of the resident officers in Colorado. Mr. Smith has been General Manager of the Denver & Rio Grande since 1887 and has had practically absolute authority in the operation of the line. He was General Superintendent of the Union Pacific between October, 1884 and 1887. His first railroad service was in 1864 on the Kansas Pacific, and he was connected with that line and the Union Pacific continuously until his resignation, April 30, 1887.

—Mr. V. G. Bogue, Chief Engineer of the Portland & Puget Sound road, the joint line of the Union Pacific and the Great Northern between Portland and Seattle, purposes to resign in a few days, as soon as some construction matters now under consideration are settled. Mr. Bogue was Chief Engineer of the Union Pacific for a number of years, but resigned last February, and since then has given his time to the Portland & Puget Sound road. He was formerly connected with the Northern Pacific. Mr. Bogue is one of the most prominent railroad engineers in this country, and is at present a member of the committee of the American Society of Civil Engineers, on standard rail section. He has been a member of the society since 1869.

—Mr. E. T. Charlton, for four years General Passenger Agent of the Central of Georgia, and, since its lease to the Georgia Pacific, Passenger Agent for the Richmond & Danville, in charge of that road, has resigned. Mr. S. H. Hardwick, formerly General Passenger Agent of the Georgia Pacific succeeds him with the title of Division Passenger Agent. Mr. Charlton's service with the Central of Georgia system had extended over a number of years. His first position was in the office of the General Superintendent. For four years he was chief clerk to the General Freight Agent; then General Freight and Passenger Agent of the Port Royal & Augusta and Port Royal & Western North Carolina for three years. With this experience he became General Passenger Agent of the Central of Georgia.

ELECTIONS AND APPOINTMENTS.

Central of Georgia.—H. R. Dill has been appointed Superintendent of the main stem division, vice W. W. Starr, resigned. Mr. Dill formerly held this office when Mr. Starr was Master of Transportation.

Chesapeake & Ohio.—C. B. Ryan has been appointed Division Passenger Agent, with office in Cincinnati, O. All passenger and traveling agents west of Charleston, W. Va., will report to him.

The general office of the passenger department has been removed to Washington, D. C.

Chicago, Milwaukee & St. Paul.—B. F. Van Vliet has been appointed Assistant Superintendent of the Iowa and Dakota Division, to fill the vacancy caused by the promotion of J. F. Gibson to be Superintendent of the Northern Division.

Chicago & New Orleans.—Hon. A. G. Murray, of Springfield, Ill., is the President of this company. Charles P. Moore, of Springfield, is Chief Engineer, and W. E. Tanner, of Farina, Ill., is Assistant Engineer. The construction company is the Central Improvement Co., of Chicago, of which Col. Charles E. Wyman is President, Joseph Underwood, Secretary, and W. H. Underwood, Jr., Treasurer.

Dalles & Des Chutes Portage.—The company has been formed by G. A. Liebe, E. B. Dufus, T. H. Johnston and R. H. Norton, of The Dalles, Or.

Eastern (Maine).—The adjourned annual meeting of the company was held at the Grand Central Hotel, Bar Harbor, Me., Aug. 28, and Eugene Hale, L. A. Emery, George W. Kimball, Davis Gillson and S. D. Bailey were elected directors.

Fairhaven & Southern.—A recent circular announces the appointment of S. S. Neff as Superintendent of this road, with office at Fairhaven, Wash., to succeed A. J. Borie, resigned. Mr. Neff was formerly Superintendent of the Cornwall road in Pennsylvania, but resigned in February and has since been connected with the Great Northern Lines in western Washington.

Kickapoo Valley & Northern.—Gen. Lucius Fairchild, Madison, Wis.; E. I. Kidd, Prairie du Chien, Wis.; W. H. Bennett, Baraboo; J. O. Davidson, Soldiers' Grove and W. S. Manning, Muscoda, Wis., are directors of this Wisconsin company. F. W. Oakley, of Madison, is General Manager of the construction company, the United States Construction Co. Chandler P. Chapman, of Madison, and Hon. P. L. Spooner are also directors.

Lehigh Valley Terminal Co.—The company has been organized by the election of the following officers: Chas. Hartshorne, Philadelphia, President; John Hood, Camden, N. J., Vice President; W. C. Alderson, Secretary; David G. Baird, Philadelphia, Treasurer.

Louisville, Evansville & St. Louis Consolidated.—Morris McDonald, Jr., has been appointed Superintendent of Transportation, to succeed George K. Lowell, resigned.

Louisville & Nashville.—S. Dunn has been appointed Superintendent of the Clarksville and Princeton division, vice Julien F. Gracey, promoted to the position of Division Freight Agent at Memphis, Tenn., made vacant by the promotion of T. Vandenberg.

Louisville, New Albany & Chicago.—George K. Lowell, Superintendent of Transportation of the Louisville, Evansville & St. Louis Consolidated road, has been appointed Assistant Superintendent of the southern division of this road, with headquarters at Lafayette, Ind.

Macon & Northern.—J. A. Droege, who has been Master of Trains on the East Tennessee, Virginia & Georgia, has been appointed Superintendent of this recently acquired branch of the Richmond & Danville, with headquarters at Eatonton, Ga.

Milford & Mount Vernon.—At a meeting of the incorporators at Mount Vernon, N. H., Aug. 29, the following officers were elected: President, W. G. Burnham, Mount Vernon; Treasurer, W. B. Rotch, Amherst; Clerk, F. E. Kaley, Milford; directors: W. G. Burnham, W. B. Rotch, F. E. Kaley and J. A. Spaulding, of Nashua.

Montana Central.—L. C. Stebbins has been appointed Traveling Freight and Passenger Agent, with headquarters at Helena, Mont.

Northern Pacific.—G. W. Vanderslye has been appointed Superintendent of the Manitoba Division, with headquarters at Winnipeg, vice F. E. Michaels, resigned.

St. Louis Merchants' Bridge Terminal.—At the annual meeting of the road recently held in St. Louis, Mo., the following directors were elected: C. C. Rainwater, Chas. D. McLure, John Whittaker, John H. Overall, L. M. Rumsey, John D. Perry, C. C. Maffit, Paul A. Fusz, Adolphus Busch, S. W. Cobb and D. R. Francis.

St. Louis Southwestern.—R. M. Galbraith has been appointed General Master Mechanic of the company, with headquarters at Pine Bluff, Ark., vice E. S. Marshall, resigned.

San Antonio & Aransas Pass.—F. A. Fulwiler has been appointed Commercial Agent, with headquarters at Cincinnati, O.; G. E. Toullerton has been made Traveling Freight Agent, with office at Waco, Tex.

Sevierley & Jeannette.—The following is the first board of directors of this company, incorporated in Pennsylvania last week: B. L. Wood, Jr., Pittsburgh, President; George S. Davison, B. G. Boileau, W. J. Scully and W. P. Wood, Pittsburgh; C. W. Wood, Port Perry, and W. G. Wilkins, Allegheny City, Pa.

South Galveston & Gulf Shore.—The officers of this newly incorporated Texas road are: President, M. F. Mott; Vice-President, J. N. Sawyer; Treasurer, Lucian Minor. The headquarters are at Galveston.

Susquehanna.—The first board of directors of this Pennsylvania road are: F. H. Goodyear, President; N. N. Metcalf, William H. Sullivan, L. T. Johnson, Frank L. Blaisdell, Sanford H. Lewis, all of Austin, Pa.; W. J. Lewis, Coudersport, and Horace N. Avery, Keating Summit, Pa. E. O. Cheney, of Austin, is Treasurer.

Taylor, Bryan & East Texas.—J. E. Tucker, A. Syms, John Allen Gano and Hugh Burns, Taylor, Tex.; John B. Peyton, Trinity, Tex.; M. Y. Randolph and W. A. Price, Madisonville; Edwin Reams and E. P. Banks, Caldwell; T. M. Mundine, Lexington, and Jasper Cole, Spencer Ford, William R. Cavit and John N. Henderson of Bryan, Tex., have been elected provisional directors of this company, organized recently at Taylor, Tex.

Texas Central.—Richard Oliver, who has been agent of the Pittsburgh & Western, at Youngstown, O., has resigned to accept the auditorship of this road. His headquarters will be at Waco, Tex.

Toledo, St. Louis & Kansas City.—J. P. Smith, hitherto Roadmaster of the Toledo division, with headquarters at Delphos, O., has been appointed Roadmaster of the St. Louis division, with headquarters at Charleston, Ill., vice J. O. Walker, resigned. Mr. Smith will be succeeded by T. A. Hann.

Union Pacific.—Samuel Melbourne, who has been connected with the passenger department of the Baltimore & Ohio, at Philadelphia, has been appointed Traveling Freight and Passenger Agent of the Union Pacific, with headquarters at Pittsburgh, succeeding Thomas S. Spear.

Western Counties.—William Fraser has been appointed General Freight and Passenger Agent and Auditor of this company, with headquarters at Yarmouth, N. S. This road is 20 miles long, and was built by the Canadian Government and opened for traffic July 27.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Abbeville & Wayeross.—Tracklaying has been completed from Bowen's Mill, Ga., south toward Swan, a distance of five miles, and it is expected to have the road completed to the latter place by Oct. 1. The road is in operation from Abbeville to Bowen's Mill, 13 miles.

Adirondack & St. Lawrence.—About 3,000 men are now at work on the construction of this road, and Lathrop & Ellsworth, who are doing work in the vicinity of Saranac Lake, have eight miles of track laid and a considerable length graded ready for ties. J. V. Hussey, of Birmingham, Ala., has been awarded the contract for a portion of the road, and is on the ground with 700 men and 86 teams. From Malone north to the Canadian line the grading is well advanced. There will be a bridge over the Trout River about 800 ft. long. Tracklaying is in progress on the line from Valleyfield, P. Q., south, and it is expected to have the line completed from that place to Malone by Oct. 1.

Bangor & Aroostook.—The locating survey has been completed on the section between Houlton and Monticello, Me., and it is stated that a very favorable line has been secured. The maximum curvature is six degrees and the grades are all below one per cent.

Cascade Portage.—All the track has been laid on this road with the exception of a short distance on the western end, where trestlework is being built for the river incline. The line is being built by the State of Oregon around the Cascade locks at The Dalles which obstruct the navigation of the Columbia River. The entire road will be in operation as soon as it has been ballasted. G. J. Farley, of The Dalles, is Superintendent.

Central Counties.—About 500 men are at work and tracklaying was begun last week on this road, which is to extend from Glen Robertson, Ont., on the Canada Atlantic, northeast across Glenarry County to Vankleek Hill, 14 miles, and it is expected the rails for the entire distance will be down by Sept. 14. The contractors, M. J. O'Brien & Co., commenced grading July 16 and had 12 miles ready for rails Aug. 15.

Chicago & New Orleans.—Oliver Ferguson & Sons, of Evansville, Ind., who have the contract for the grading on about 130 miles of this line, south of Farina to the Ohio River, have completed 20 miles of the grading in Marion County, and have at present about 200 men and 100 teams employed on the work. The tracklaying will probably be commenced about Nov. 1. The grading now being done averages about 25,000 cu. yds. to the mile. The maximum grade is about 40 ft. to the mile, and the maximum curvature is four degrees. As previously stated, a new survey has been completed for the line south of Shelbyville. The road, as now proposed, extends south in a nearly direct line through Altamont, Farina, Iuka, Marlow, Opdyke and Taylor; southeast through Harrisburg to Golconda, on the Ohio River, and southwest to Brooklyn, opposite Paducah, Ky. The length of this line is 190 miles.

Chicago & Northwestern.—Arrangements are being made to build a line to Waupun, Wis., which is on the Chicago, Milwaukee & St. Paul, about three miles north-west of Chester, on the Janesville & Fond du Lac line of the Northwestern.

Concord & Montreal.—Surveys will soon begin for a railroad from the Manchester & North Weare branch at Weare south to New Boston, N. H., a distance of 10 miles, and it is said the capital has all been provided.

Coronado.—Articles of incorporation were filed by this company at San Diego, Cal., last week for an extension. The road is now in operation between Coronado and San Diego, a distance of 22 miles, and it is proposed to extend it northward as soon as the surveys have been completed and the right of way secured. A large part of the right of way can only be secured by condemnation proceedings, and this may cause considerable delay in beginning work on the extension.

Cumberland Valley.—A survey is now being made for a branch of the Southern Pennsylvania road, which is operated by this company, to extend from Richmond, Pa., north through Franklin County, on the east side of the Cove Mountains to Fannettsburg in the Path Valley, about seven miles. It is proposed to begin the construction of this road at once. The line runs near the Path Valley coal fields.

Dakota, Wyoming & Missouri River.—The contract for building the first 100 miles of this road, referred to last week, from Rapid City, S. D., to the coal fields in Wyoming, has been let to C. D. Crouch, of Rapid City, and work was begun by him last week.

Delaware, Lackawanna & Western.—The branch from New Milford southwest to Montrose, Pa., 10½ miles long, has been completed, and was placed in operation last week. The first five miles of the line is through forests of hemlock, beech and maple; the balance of the line is through a cultivated farming country.

Duluth Terminal.—A committee of the City Council which has been considering schemes for railroad terminals at Duluth, Minn., has recommended that the city or a belt line railroad company secure, if possible, the tracks and right of way of the St. Paul & Duluth to Fond du Lac and to Carlton; of the Duluth & Iron Range road to Lester River, and of the St. Paul & Duluth and Northern Pacific on Rice's Point. The plan is to also include development of facilities on Minnesota Point. The city and county will probably subscribe \$500,000 in bonds to the capital stock of a company organized to carry out this or a similar scheme.

Duluth & Winnipeg.—Tracklaying has been begun on the extension from Cloquet, the eastern terminus, toward Duluth, Minn., where connection is made with the Duluth Terminal.

Findlay Belt.—Grading has been completed on this ten-mile road, which will encircle the city of Findlay, O., and tracklaying will begin the latter part of October. There are two bridges across the Blanchard River, each about 150 ft. long. The line will cross five railroads.

Georgia Roads.—The following bills have been introduced in the Georgia legislature: To incorporate the Tobacco Belt & Florida; Brunswick, La Grange & Northwestern; Jessup & Wayne; and the Transval, to build a road east and west across Bibb County, with Geo. B. Turpin and others as incorporators. A bill has been passed incorporating the Cincinnati, Georgia & Florida; and the Fairmount Valley and Talbotton Western roads have applied for amendment of their charter.

Genesis & Obed River.—It is reported that there is some activity concerning the construction of the northern end of this road and the final location is now being made from Deer Lodge, Tenn., eastward about seven miles to Sunbright, Morgan County, on the Cincinnati, New Orleans & Texas Pacific. The road was projected to extend about 60 miles in a general north and south

direction through Cumberland County, and spasmodic attempts at construction have been made occasionally for the last two years, but the fondness of the southern people for biblical names seems to have been the only thing that has kept the project alive. The office of the company is now at Crossville, Tenn., and Captain L. Beecher is the President.

Grayling, Twin Lakes & Northeastern.—The contract will probably be let to William Crampton, of South Bay City, Mich., who was the lowest bidder, for grading this road from Grayling, Mich., on the Michigan Central, northeast to Twin Lakes, Montmorency County, a distance of 27¼ miles.

Great Northern.—Geo. W. Hughes has recently been awarded a contract for grading 25 miles of the Pacific extension from Chatteroy, Wash., west of Pend d'Oreille River to the Little Spokane River and Diamond Lake. There is considerable rock work on the section and one small tunnel will have to be driven. The company is to build a branch from the Spokane River south about 20 miles to Spokane, Wash. The line has been located from the end of the present contract west to Waterville in the Big Bend country where the Columbia River will be crossed, and thence to the Cascade Mountains. The grading and tracklaying will probably be continued to the Columbia River during the winter. The company is believed to have decided upon the pass through which the road will be built across the Cascade Mountains, but the officers refuse to make any statement in the matter. It is believed that the Snohomish or Skagit pass has been selected.

Gulf, Brazos Valley & Pacific.—Gurley, Ross & Gurley, who were the projectors and contractors for building this road north of Waco, applied last week to the District Court of Palo Alto County for the appointment of a receiver for the road, but Judge Goodrich denied the application, and at the same time dissolved the injunction forbidding the sale of the property under the attachment of the Waco State Bank. Only a short section of the line between Mineral Wells and Millsap, Tex., was completed before the suspension of work last year.

Hunter's Run & Slate Belt.—The contract for building this road, which is projected to extend from Pine Grove Furnace, Pa., to slate quarries, a distance of 5½ miles, has been awarded to L. L. Bush, of Bird in Hand, Pa. The preliminary survey has been completed, fixing the maximum grade at 190 ft. to the mile and the maximum curvature at 20 degrees. The route lies through a wild mountain region and the transportation of slate, iron ore and agricultural products will constitute the principal business of the road when built. A. E. Lehman, 711 Walnut street, Philadelphia, Pa., is Chief Engineer.

Johnson City & Greensboro.—The engineers have completed the survey south of Johnson city to a point south of Cook's Gap, and are now working toward Patterson. The surveys will probably be continued through Watauga and Caldwell counties along the south side of the Blue Ridge Mountains to the headwaters of the Yadkin River, and thence to Patterson. The line is to be extended to the Cranberry coal fields and to Greensboro, N. C. Henry E. Colton, of Knoxville, Tenn., is Chief Engineer.

Lake Champlain & Moriah.—Burke Bros., of Scranton, Pa., contractors for the Fisher Hill branch, which is to extend from Mineville, N. Y., north to near Elizabethtown, a distance of two miles, expect to have the work completed and the road opened for traffic by Sept. 15. The maximum grade is 4.1 per cent., and the maximum curvature is 13.5 degrees. The ore beds of the Port Henry Iron Ore Co. and other parties will furnish the principal business for this branch.

Lake Jessup, Indian River & Atlantic.—The locating survey for this road, referred to in the *Railroad Gazette* of July 17, to extend from Lake Jessup to Coquina, Fla., 45 miles, has been completed by J. O. Fries, Chief Engineer. His headquarters are at Orlando, Fla.

Louisville, New Orleans & Texas.—A branch is nearly completed from Litcher Station, La., 42 miles north of New Orleans, to the sawmill of Litcher & Moore, 6 miles. This mill manufactures large quantities of cypress lumber.

Maine Shore Line.—The engineering party which began the preliminary survey for the section between Hancock, the western terminus, and Columbia Falls, Me., a distance of 30 miles, has made rapid progress, and will probably complete the survey in six weeks. Engineer Hillard, of Old Town, who is in charge of the party, will then make a survey for the line between Columbia and Machias, 20 miles. The engineers who are surveying the branch at the eastern end of the line from Calais, south, have run the line through Red Beach and Robbinston, and as far as Perry, a distance of 15 miles.

Mexican Northwestern.—Rails have been laid on four miles of this line from the Mexican Central at the city of Chihuahua. Construction has also been begun at Palomas on the line running south.

Milford & Mount Vernon.—This road was chartered by the last New Hampshire legislature to construct a railroad from Milford, on the Nashua & Wilton line of the Boston & Maine, northward to Amherst and Mount Vernon, about 5½ miles.

Mount Moosilauke.—F. W. Conn, Chief Engineer, estimates that the cost of constructing the road from Warren Station, N. H., to the summit of Mount Moosilauke, 20 miles, will be \$400,000. The maximum grade will be four per cent., and the maximum curvature 15 degrees.

Nashville & Knoxville.—The grading on the extension east of Cookeville, Tenn., through Putnam County, was begun last week by J. H. Connor, who is reported to have a force of nearly 500 men at work. The C. C. King & Brothers Construction Co. has a contract from the railroad for the 17 miles to the coal fields at Standing Stone which it is said has been sublet to J. H. Connor.

New Orleans Belt.—The Public Belt Railroad Association, which is an organization of the business men of New Orleans, has issued a prospectus proposing the following route for a belt road: Commencing at Audubon Park, down the levee to Poland street, to Florida walk; thence to and up Monroe avenue to Upperline, to North street; thence to the intersection of Claiborne and Walnut avenues and to the starting point on the levee. This route is on the outer circle, beyond the public grounds, and would relieve the principal streets of the many tracks of the various railroads. The railroads have organized a belt line company, which has applied for a franchise to

lay tracks on Claiborne and other business streets. To prevent the construction of such a line the Public Belt Railroad Association was formed. It is estimated that a road built on the "outer circle" route would cost \$700,000, of which \$100,000 is now subscribed. One-half of the net earnings are to be paid to the city. The articles of association limit the charges to be made for switching.

New Roads.—A survey of a proposed road from Santa Cruz to Fresno, Cal., a distance of about 120 miles, is now being made for H. B. Hobson, of San Francisco. The survey was begun Aug. 15, at Santa Cruz, and is to extend parallel to the Southern Pacific to Aptos and Watsonville, and thence through San Benito County and the San Miguel cañon, the San Juan valley, and across the San Benito River to San Felipe. The route is then through the Pacheco pass to the San Joaquin valley, and through a level country to Fresno.

W. P. Chandler, of Farmersville, La., has secured all the right of way for the proposed road from Monroe northwest to Farmersville, a distance of 32 miles. The town of Monroe has voted \$50,000 as a bonus to aid in the construction of the line; Farmersville has voted \$25,000, and the parishes of Union and Ouachita have voted a five mill tax for five years.

A road is to be built from Lexington, Va., to the quarries of the Lexington Quarry Co.

It is reported that a company has been incorporated to build a railroad from Poplar Grove, Ark., on the Arkansas Midland, southwesterly, about 5 miles, to Trenton.

Norfolk & Western.—About 400 men are working on the ballasting between Kenova, on the Ohio River, and Wayne, C. H., W. Va., a distance of 20 miles. South of Wayne the track has been laid for a considerable distance, and work is now in progress along the right-hand fork of Twelve Pole River.

The contract has been awarded to Rogers & O'Brien, of Roanoke, Va., for building $1\frac{1}{2}$ miles of the belt line at Roanoke.

Northern Central.—A party of engineers are surveying a line for a proposed extension of the Green Spring branch from Green Spring, Md., northwest to Westminster. One line has been surveyed through the Beaver Creek Valley, by way of Cook's Run. Another goes by way of Reisterstown; both are generally parallel to the Western Maryland road.

Northern Pacific.—About 18 miles of the grading on the western end of the Chehalis & South Bend Branch is now ready for the rails east of South Bend, Wash. The work is now going on on the third 10-mile section and there remains only a gap of 15 miles separating the workmen from those working west from Chehalis, on the main line.

The company has sent engineers into the field to locate a route from Moses Coulee to the Okanogan mines. An extension from Lewiston to Camas Prairie is under consideration.

The Lake Washington Belt Line, extending from Seattle, Wash., to Lake Washington, 27 miles, has been completed, and will soon be turned over to the operating department.

The company proposes to build a branch from Alton, Thrall County, N. D., to some point on the line at or near Halstead, Minn. Notice of this proposition has been filed with the Secretary of State at Bismarck, N. D.

Pacific & Eastern.—This company, the local papers state, filed its charter in Oregon in February, but the action has only now been made public. The road is chartered to build from Astoria through southern Idaho toward Salt Lake City. The route is from Astoria up the Tillamook River, across the Coast range to the headwaters of the Yamhill River and to the east side of the Coast mountains; thence south through the Willamette Valley to Springfield, and easterly crossing the Cascades by way of the Middle Fork of the Willamette to East Cascades; thence easterly by way of Harney Lake Valley to eastern Oregon. It is also proposed to build from Astoria to Portland and south along the Willamette Valley. Frank J. Taylor, M. J. Kinney, and H. G. Van Dusen are incorporators. The principal office is at Astoria, Or.

Pennsylvania.—The following are the contractors on the extension of the Pennsylvania Schuylkill Valley road from Pottsville to Minersville, Pa., seven miles: William McAdams, the first section, two miles through Pottsville; John Dyer, of Norristown, Pa., next two miles; John H. Gorman, of Pottsville, one mile, including the heaviest work on the line; and A. J. Cushman, of Philadelphia, the last two miles. The line may be extended to Williamstown next year.

Philadelphia & Reading.—The right of way is being secured for a proposed branch from Oak Lane, Philadelphia, to Olney, near Germantown.

The terminal company, formed to build the elevated road to Market street, in Philadelphia, has just secured two important pieces of property, worth together about a million dollars, long pending negotiations with the Farmers' Market Company and other owners having just been terminated amicably.

San Francisco & North Pacific.—The extension of the Guerneville Branch from Guerneville, Cal., west about $1\frac{1}{2}$ miles, has been completed and will soon be put in operation.

Savannah, Brunswick, Atlanta & North-western.—The charter of the company was filed with the Secretary of State of Georgia, last week. The capital stock is \$3,500,000. The road is to extend from a point in Wayne County, west of Brunswick, near Waynesville, Northwest to Fort Valley, the terminus of the Atlanta & Florida. The distance is about 150 miles. The incorporators are: W. D. Wheelright, J. O. Bloss, George T. Dickson, Herbert Richmond and W. W. Walton, all of New York City. The principal office is to be at Fort Valley, Ga.

South Bound.—The first train will be run over this entire road, which has just been completed, from Savannah, Ga., to Columbus, S. C., a distance of 150 miles, on Sept. 7. The road was built by the Savannah Construction Co., who sublet the contract to J. E. Moore & Co., Graham, S. C.; Holshausen & Schiltz, and Moore & Springs, of Columbia, S. C.; and S. R. Adams & Co., J. A. Newcomer & Co., Hartnett & O'Brien, and J. M. Willis, Brunswick, S. C. The maximum grade is 52.3 ft. per mile, and the maximum curvature $5\frac{1}{2}$ degrees. The longest trestles are the Savannah River, 3 miles long; Coosawahatchie Swamps, at Sulkehathe, 5,000 ft.; South and North Edisto rivers, 4,000 ft. each; and at Caugaree Creek, 3,000 ft. There are two other trestles 1,500 and 1,700 ft. long each.

Southern California.—Engineers are reported to be making surveys for a proposed re-location of the road south of Temecula, in southern California. The survey

has been made through Vista, eight miles east of Ocean-side, and is to be continued through Fallbrook to near Temecula, avoiding the Temecula cañon and other heavy grades on the present line.

South Galveston & Gulf Shore.—Surveys are in progress on this road, recently incorporated in Texas, to build a road 20 miles long, extending from about two and one-quarter miles within the city of Galveston southwest along Galveston Island to South Galveston. Profiles and estimates are now about completed, but no contracts have as yet been let. The character of the work is easy, the line being practically level.

Snohomish, Skyhomish & Spokane.—The survey for the line from Snohomish, Wash., to the mouth of Silver creek is now being revised at its western end. King and Dickinson, of Tacoma, have the grading completed for several miles near Snohomish. Surveys are being made west of Snohomish to the Cascade Mountains, and it is stated that the contracts for building this section will be let as soon as the locating survey has been completed. A. A. Allen is General Manager, and John J. Folstad is Chief Engineer.

Sumpter Valley.—The track laying on this road in eastern Oregon has now been completed with the exception of the last few miles. The line is 25 miles long and extends from Baker City, on the Union Pacific, along the Powder River to Sumpter Valley. The track laying has been delayed recently by the unfinished bridge at the lower narrows of Sumpter Valley. This was completed last week and the track has been laid across the structure.

Susquehanna.—This company was chartered at Harrisburg, Aug. 31, to build a line 14 miles in length from Costello, Potter County, to Halls, on the east fork of the Sinnemahoning River. The capital is \$140,000. A. F. Goodyear, of Austin, Pa., is President. This appears to be an extension of the Sinnemahoning Valley road, of which Costello is the southern terminus.

Toledo & Ohio Northern.—John Newell, of Cleveland, O., President of this company, referred to last week, writes as follows: "The line is to extend from Fayette, Ind., westerly through Pioneer to the state line, to a connection with the Toledo & Indiana Northern. The location has been made to Pioneer, and a preliminary line run thence to the state line. As soon as satisfactory bids are obtained the work from Fayette to a crossing of the Cincinnati, Jackson & Mackinaw, about six miles, will be put under contract. The grading is light; maximum grades 20.4 ft. to the mile, with no important trestles and bridges." C. P. Leland is Secretary.

Toronto Belt Line.—This road will probably be transferred to the Grand Trunk shortly, and will then be placed in operation. The track has been laid for nearly the entire length of the line on the western and northern sides of the city. The road begins at a connection with the Northern & Western Division of the Grand Trunk west of the Union station and north of Eglinton avenue near Davenport (Toronto). It extends to Fairbank, where the tracks are at an elevation of 332 ft. from the bay, and thence east to Forest Hill, the new Upper Canada College, and Yonge street, which is crossed overhead, and through Mount Pleasant Valley and Moore Park, crossing the Canadian Pacific on the north side of the city to the Don Valley where the track at present ends. The road has not been ballasted beyond Yonge street. J. P. Edgar, of Toronto, is President, and H. Carry is Chief Engineer.

Unaka & Nolichucky.—R. A. Bowie, Chief Engineer, has commenced surveying the line from Erwin, Tenn., to a point on the Knoxville Southern near Knoxville, Tenn.

Union Pacific.—A local paper states that the 12 miles of track which was laid in 1890 on the Northern Division of the Pioche extension from Milford, Utah, south, is now being taken up. This is not understood to mean that the extension will be abandoned.

Vela-co Terminal.—It is reported that Burkett, Murphy & Burns, of Fort Worth, Tex., have been given the contract by E. S. Dreyer, of Chicago, for grading the first 22 miles of this road from Velasco at the mouth of the Brazoria River, northeast to the connection with the International & Great Northern at Chenango. The line is over a generally level country, and work will probably be prosecuted rapidly.

Waterloo Junction.—The contractor on this branch of the Grand Trunk, J. C. Boyd, of Simcoe, Ont., has completed tracklaying from Waterloo, Ont., northeast to St. Jacobs, five miles. The first freight train passed over this branch Aug. 22. The large bridge across the Conestoga River will soon be finished, and construction work is progressing on the remaining six miles to Elmira.

Welsh Colony.—This company was incorporated in West Virginia last week to build a road from Arron, Webster County, by the most practicable route to Sugar Creek, Buckhannon, Holly River and Little Kanawha River, and to connect with any railroad that may be built to within 20 miles of Arron. The capital stock is \$10,000, divided into shares of \$25 each, and the headquarters will be at Arron. D. S. Thomas, of Edwardsville, Pa., and others are interested.

Western Maryland.—Ryan & McDonald, of Baltimore, Md., contractors for building the line from Williamsport, Md., to a connection with the Baltimore & Ohio at Cherry Run, W. Va., have completed the grading between these points.

West Range.—This line has just been completed to the mining region at the west end of the Gogebic region in northern Wisconsin. The road extends from Mellen, on the Wisconsin Central, a few miles east of Ashland, on Lake Superior, south to Mineral Lake, passing through heavy pine districts.

West Shore Transportation Co.—W. E. Huger, of Charleston, S. C., and others have organized this company, and propose to apply to the next session of the South Carolina Legislature for a charter which will authorize the construction of a belt road at Charleston.

Wilmington, Onslow & East Carolina.—Grading has been completed for a distance of about 11 miles on the extension from Jacksonville, N. C., the present terminus of the road, northeast to a connection with the Atlantic and North Carolina at Newbern, N. C., 35 miles. No contracts have been let, as the company is doing the work with its own forces.

GENERAL RAILROAD NEWS.

Allegheny Valley.—In the United States Circuit Court at Pittsburgh last Monday, Judge Acheson handed down an opinion in the case of the Pennsylvania, the

Northern Central and the Philadelphia & Erie against the Allegheny Valley, Whelan and Murray, Trustees, and others. The opinion was as to what terms with respect to the discharge of liens the sale of the franchises and property of the Allegheny Valley should be made, and is a victory for the Pennsylvania. Judge Acheson decided that the sale should be made on the original bill filed in 1884. The decision is important as affecting the standing of the income bonds and stock of the company, although it is possible that an appeal to the Supreme Court may yet be taken. The sale is ordered subject to the general mortgage of \$4,000,000, to the principal of the first mortgage of \$10,000,000, to the past due and unpaid interest on the first mortgage, and to the second mortgage (due the State), of which all but about \$2,000,000 has been paid; but the purchasers are relieved from the burden of the income bonds, of which \$9,728,700 are outstanding, the capital stock amounting to \$2,156,500, and the interest not yet due upon the first mortgage of \$10,000,000. The Pennsylvania has bought up the coupons on the first mortgage bonds as they fell due to the amount of about \$8,000,000, and together with the Northern Central, and the Philadelphia & Erie is the owner of about \$6,000,000 of the income bonds. If no appeal be taken within the limit of time allowed by law, the sale will doubtless be made immediately thereafter, and the long and tedious litigation will probably end in the absorption of the Allegheny Valley by the Pennsylvania.

Atlanta & West Point.—The following table gives the earnings for the year ending June 30:

	1890.	1889.	Inc. or dec.
Gross earnings.....	\$433,053	\$473,441	I. \$40,388
Oper. expenses.....	356,636	306,078	I. 50,558
Net earnings.....	\$126,417	\$168,763	D. \$42,346
Gross earn. per mile.....	5.610	5.498	I. 112
Oper. expen. per mile.....	4.142	3.543	I. 599
Net earn. per mile.....	\$1.468	\$1.955	D. .487
P. c. of exp. to earn.....	73.8	64.4	I. 9.4

The cost of maintenance of way and structures was \$108,730, an increase of \$19,121; maintenance of equipment, \$62,270, an increase of \$16,387; conducting transportation, \$126,974, an increase of \$9,646. The maintenance of way expenses included \$21,422 for new rails, and \$37,112 for rebuilding the Chattahoochee Bridge.

Boston & Maine.—The quarterly report to the Massachusetts Railroad Commission gives the following figures of earnings for the three months and nine months to June 30.

	1891.	1890.	Inc. or dec.
Three months to June 30:			
Gross earnings.....	\$3,854,173	\$3,833,128	I. \$21,045
Oper. expenses.....	2,413,085	2,373,580	I. 39,505
Net earnings.....	\$1,441,088	\$1,459,548	D. \$18,460
Other income.....	16,143	22,892	D. 6,749
Total net.....	\$1,457,231	\$1,482,440	D. \$25,209
Int., taxes and rentals.....	962,446	1,027,180	D. 64,734
Surplus.....	\$494,785	\$455,260	I. \$39,525

	1891.	1890.	Inc. or dec.
Nine months to June 30:			
Gross earnings.....	\$10,813,751	\$10,576,622	I. \$237,129
Open expenses.....	7,259,153	7,011,722	I. 247,431
Net earnings.....	\$3,554,598	\$3,564,900	I. \$10,302
Other income.....	222,543	235,614	D. 13,071
Total net.....	\$3,777,141	\$3,799,514	D. \$22,373
Int., taxes and rentals.....	2,891,907	2,630,252	I. 261,655
Surplus.....	\$885,234	\$769,262	I. \$115,972

The "other income" account for the three months in 1891, \$16,143, is so small because deductions were made on account of over credit in previous quarters.

Cairo, Vincennes & Chicago.—Judge Allen, of the United States Court at Springfield, Ill., recently rendered, in a suit brought against Pulaski County, Ill., by August T. Post, of New York, a decision declaring bonds to the amount of \$100,000 issued by that county in aid of this road in October, 1872, invalid. The county had declined to pay the coupons on the ground that no regular notice was given of the election at which the question of issuing the bonds was decided. This road is now a part of the Cleveland, Cincinnati, Chicago & St. Louis system.

Chicago, Burlington & Quincy.—The following table shows the operations of the company for July, 1891, and the seven months Jan. 1 to July 31, compared with the corresponding periods of last year:

	1891.	1890.	Inc. or dec.
Month of July:			
Gross earnings.....	\$2,761,495	\$2,361,300	I. \$400,095
Operating expenses.....	1,631,027	1,950,723	D. 319,696
Net earnings.....	1,130,468	410,576	I. 719,892
Fixed charges.....	800,000	773,566	I. 26,434
Surplus.....	330,468	def. 2,840	I. 333,308
Jan. 1 to July 31:			
Gross earnings.....	17,531,081	19,658,423	D. 2,127,342
Operating expenses.....	11,332,969	13,296,164	D. 1,963,195
Net earnings.....	6,198,082	6,362,259	D. 164,177
Fixed charges.....	5,532,000	5,414,909	I. 117,091
Surplus.....	666,082	947,350	D. 281,268

Chicago & Erie.—The \$190,000 which has been earned in the last 10 months has been paid over to the New York, Lake Erie & Western for advances made in previous years, thus postponing the payment of interest on the income bonds another year.

Cincinnati, New Orleans & Texas Pacific.—The Company reports gross earnings for June of \$343,403, a decrease of \$23,948 as compared with the same month for last year, and net \$105,908, a decrease of \$23,801. For the 12 months ending June 30 the gross earnings were \$4,370,142, an increase of \$69,993 as compared with the corresponding period of last year, and net \$1,444,040, a decrease of \$21,322.

Great Northern.—The company has prepared plans for the depression of its tracks through a number of the streets in East Minneapolis and has submitted them to the city council. It is estimated that the expense of abolishing the grade crossings as proposed in these plans will be over \$275,000. They involve the lowering of the tracks from Central Avenue west to the viaduct now nearly completed. It will be necessary to construct bridges at Main, Second, Fifth and Seventh streets and at Central Avenue and to lower the bridges across both channels of the Mississippi River and on Nicollet island. The city is asked to build the approaches for the bridges, which will cost about \$80,000, and to grant the railroad additional right of way along the streets to lay an additional track.

International & Great Northern.—The report of the legislative joint investigating committee appointed to examine the affairs of this company has been published. The report proper is signed by Representatives McKim-

ney, Gresham, Brietz and Crain, and acquits Judge McCord and the receivers of anything involving official misconduct or wrong-doing. It is in the main a record of the facts in the case as developed by the investigation, together with some recommendations governing the laws as to receiverships, which are said to be defective. The prosecuting evidence in the case is filed also and made a part of the report. Senator Garwood agrees in the main with the majority, but filed a minority report criticising Judge McCord severely.

Kansas City, Memphis & Birmingham.—The directors, in the circular advising the first mortgage bondholders to fund their coupons for the next two and a-half years, say that the original cost of the road exceeded the estimates, so that when it was completed it had no cash or surplus bonds in the treasury, and its equipment was inadequate. In the year 1890-91, however, it earned its fixed charges, including interest on the bonds of the Birmingham Equipment Company, payment of which it was obliged to assume, in order to procure rolling stock necessary to the operation of the road. The floating debt is about \$175,000, mainly incurred to pay the coupons of last March. Ten-year notes bearing semi-annual interest at six per cent. are offered for the coupons, the latter to be deposited with a trustee. The equipment bondholders will not be asked to surrender any of their coupons as the terms upon which the road holds the equipment are more favorable than could be obtained now. Some of the first mortgage bonds, which have sold at about 80, went for 75 in Boston this week.

Long Island.—The new freight station which is to be established at Bay Ridge on the shore of New York Bay south of Brooklyn, is to be used only for bulk freight. New car floats are to be built, and the transfer of cars to and from the railroads terminating in Jersey City will be an important part of the business at the new station.

Louisville & Nashville.—The following shows the earnings and expenses of the company for July, 1891, compared with the same month of last year:

	1891.	1890.	Increase.
Mileage.....	2,856	2,224	603
Gross earnings.....	\$1,866,791	\$1,515,182	\$321,609
Operating expenses.....	1,175,590	1,007,306	168,284
Net earnings.....	\$691,201	\$507,876	\$183,325

Mexican Southern.—Track has been laid since Jan. 1 on this road from Santa Cruz, Puebla, to Tecomavaca, Oaxaca, a distance of 74 kilometers. Work is progressing on the line from the latter place to Oaxaca, 146 kilometers. Read & Campbell, of Puebla, Mex., are the principal contractors.

Missouri, Kansas & Texas.—The road is negotiating for the purchase of the property and franchises of the Denison & Washita Valley road in the Indian Territory.

New Orleans & Northwestern.—C. H. Hammond, of Kansas City, President of the road, and W. D. Jenkins, of Natchez, Miss., the Chief Engineer, have been appointed receivers by the United States Circuit Court for Louisiana, on the application of the bondholders and stockholders. The suit is an amicable one and is brought to adjudicate the interests of the various creditors. The road is now in operation from Vidalia, opposite Natchez, to Rayville, La., 77 miles.

New York, Chicago & St. Louis.—The statement for the quarter ended June 30 shows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$1,357,898	\$1,319,211	I. \$38,687
Operating expenses.....	1,114,240	1,049,225	I. 65,015
Net earnings.....	\$243,658	\$269,986	D. 26,328
Other income.....	5,546	4,933	I. 613
Fixed charges.....	254,192	251,659	I. 2,533
Deficit.....	\$34,988	\$23,259	I. 11,729
Cash on hand.....	459,834	519,203	D. 69,369
Profit and loss surplus.....	196,774	224,122	D. 27,348

*Surplus.

New York, Lake Erie & Western.—The following table shows the operations of the company for July, 1891, and the ten months to July 31, as compared with the corresponding periods of the last fiscal year. Both the gross and net earnings for July were the largest in the history of the company.

Month of July:	1891.	1890.	Inc.
Gross earnings.....	\$2,818,302	\$2,594,124	\$224,178
Oper. expenses.....	1,715,471	1,599,869	115,602
Net earnings.....	\$1,102,831	\$994,255	\$108,576
Less proportions due leased lines.....	29,250	237,654	21,397
Net earnings.....	\$843,671	\$806,601	\$177,069
Oct. 1 to July 31:			
Gross earnings.....	\$24,209,114	\$23,700,534	\$508,580
Oper. expenses.....	15,912,388	15,581,183	331,205
Net earnings.....	\$8,296,726	\$8,119,351	\$177,375
Less proportions due leased lines.....	2,122,238	2,117,805	4,433
Net earnings.....	\$6,174,488	\$6,001,546	\$172,942

New York & New England.—The earnings of the road for July are shown in the following table:

	1891.	1890.	Inc. or dec.
Passenger.....	\$204,076	\$191,367	I. \$12,709
Freight.....	298,386	303,386	D. 5,000
Mail.....	5,685	4,920	I. 765
Express.....	19,669	10,709	I. 8,960
Miscellaneous.....	18,401	15,020	I. 3,380
Gross earnings.....	\$545,617	\$525,392	I. \$19,225
Since Jan. 1.....	\$3,464,635	\$3,327,200	I. \$137,435

Chicago, Milwaukee & St. Paul.—The following is the statement of earnings for the month of July:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$2,309,551	\$2,149,067	I. \$160,484
Oper. expen., in taxes.....	1,584,240	1,482,342	I. 101,898
Net earnings.....	\$725,311	\$666,725	I. \$58,586

Norfolk & Western.—The earnings of the company, including the Scioto Valley and Maryland & Washington divisions, for July, 1891, and the seven months, Jan. 1 to July 31, were as follows:

Month of July:	1891.	1890.	Increase.
Gross earnings.....	\$760,706	\$749,538	\$11,168
Operating expenses.....	482,272	476,424	5,848
Net earnings.....	278,434	273,114	5,320
Jan. 1 to July 31:			
Gross earnings.....	5,038,716	4,722,662	316,054
Operating expenses.....	3,438,288	3,228,502	209,786
Net earnings.....	1,600,428	1,494,160	106,268

Old Colony.—The annual report of the road for the fiscal year ended June 30 shows: Gross earnings, \$8,376,462, against \$8,020,295 in 1890; net, \$1,906,178, against \$2,050,854, and surplus above fixed charges \$12,955, against \$107,614 last year.

Pacific Short Line.—At the request of the Manhattan Trust Company, of New York, the sale of the road, which was advertised to take place at Omaha, Neb., Sept. 1, was postponed by Receiver Bierbower. The court not being in session, a new decree will have to be entered before the date of the sale can be announced.

Pennsylvania.—The earnings of the lines west of Pittsburgh and Erie for July, 1891, as compared with the same month in 1890, show an increase in gross earnings of \$85,128; decrease in expenses of \$46,212, and an increase in net earnings of \$131,340. The seven months of 1891, as compared with the same period of 1890, show a decrease in gross earnings of \$1,107,400; decrease in expenses of \$1,448,700, and an increase in net earnings of \$341,300.

St. Louis, Merchants Terminal Co.—The annual report for the fiscal year ending June 30, gives the gross earnings as \$111,901. Receipts from freight were \$96,536; from passengers, \$1,743, and miscellaneous, \$13,622. The company handled 25,437 loaded cars, containing 390,836 tons of freight, and carried 17,719 passengers. Over 50 per cent. of the earnings were derived from traffic handled during the last three months of the fiscal year. Freight yards have been established at Ferry Branch, North Market, Florida and Gratiot streets, and a new freight house has been completed at Main and Biddle streets, St. Louis.

Syracuse & Baldwinsville.—The three trains which have been running daily on this road between Baldwinsville and Amboy, N. Y., seven miles, have, it is reported, been taken off by the Delaware, Lackawanna & Western, which recently came into possession of the road, and the operation of the line discontinued.

Western of Alabama.—The annual report for the year ending June 30 gives the following statement of the result of the year's operations:

	1891.	1890.	I.	D.
Gross earnings.....	\$572,220	\$566,050	I.	\$6,170
Operating expenses.....	419,978	356,209	I.	63,769
Net earnings.....	\$152,242	\$209,842	D.	\$57,600
Gross earnings per mile.....	4,334	4,288	I.	46
Expenses per mile.....	3,181	2,698	I.	483
Net earnings per mile.....	\$1,153	\$1,591	D.	\$437
P. c. expen. to earnings.....	73.3	62.9	I.	10.8

Wheeling & Lake Erie.—The officers have issued a statement giving a summary of the improvements recently made on the road. The belt line in Toledo has been made double track and the extension to Steubenville and Martins Ferry, connecting with the Wheeling Bridge and Terminal Company's line into Wheeling has been completed. On the Steubenville extension direct connections have been made with the Jefferson Iron Works, the Mingo Iron Works, and the Loughlin Iron Works. A connection has been established with a packet line, which runs to Steubenville from East Liverpool, and this line carries the freight from the large potteries and brick industries located on the Ohio River. At Huron, on Lake Erie the dock frontage has been increased about 600 ft. by special act of Congress, and the depth of water has been increased to 16 ft. The facilities for handling coal and ore have been increased threefold. The terminals at Huron contain 70 acres. The Michigan Central now transfers the cars of the Wheeling & Lake Erie from its own line to those of the "Clover Leaf" and Wabash roads. This year is the first in which this connection has been in force, and it will add materially to the general business of the company. The equipment has been increased by 22 locomotives, 200 box cars and 1,000 coal cars. The Wheeling, Lake Erie & Pittsburgh Coal Co., which is controlled by the road, has erected 109 additional houses for miners, and 90 more are to be completed during the season. The output of coal for June was 50,404 tons and is increasing. The company has opened new mines in the Mount Pleasant district, and one in the Massillon district.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Sept. 2, 1891.

The Commissioners of the Western Traffic Association will be in session Sept. 4 and 5. They have a number of important questions before them, but no decisions are looked for until the full board can meet and discuss them.

In the appeal to arbitration by the Chicago, Rock Island & Pacific from the decision of Chairman Finley, which adjudged this company guilty of violating the agreement in maliciously prosecuting the Atchison for the sale of a ticket at reduced rate, the arbitrators, Messrs. Francis, Davis and Fee, confirm the decision of the chairman, and the Rock Island will have to pay over to the Atchison the \$100 originally adjudged.

In the matter of the appeal to arbitration by the Chicago, St. Paul, Minneapolis & Omaha, from a decision of Chairman Finley, finding that road guilty of doing a brokerage business, through the action of its agent in directing a prospective passenger to a broker, the majority of the arbitrators, Messrs. Whitney and Davis, find that the defendant is not guilty, and reverse the decision of the chairman. Arbitrator Fee files a minority report sustaining the chairman.

Freight matters are unusually quiet. There are several important matters pending in the associations, however. The Burlington has applied to the commissioners for a rate on bulk salt from Chicago to Nebraska points, the same as from Hutchinson, Kan., to the same points. At present Hutchinson has an advantage of 2 cents on this commodity, but the rate on salt in barrels is the same. The whole question of salt rates is now before the Western Traffic Association for adjustment, but the Burlington claims that the packers are now buying bulk salt and that if compelled to wait until the decision of the commissioners is announced the road will get none of the business.

The Chicago & Alton having announced a one fare round trip rate from all stations to St. Louis for the Odd Fellows' encampment, Sept. 21, the other lines will be obliged to meet it. The association lines had voted to make a fare of one and one-third.

Some of the roads in the Northwestern Passenger Agreement have been furnishing erroneous statements of their business to the Advisory Board, and Chairman Finley has notified the interested roads that it will be necessary to issue revised statements for the months of June and July.

Traffic Notes.

Through shipments of freight from California eastward over the Southern Pacific in July amounted to 26,143 tons, an increase over the same month of last year of 5,553 tons. The aggregate for the first seven months of this year shows a still more rapid growth, the increase being about 36 per cent. over last year.

The Baltimore & Ohio Southwestern, which first made the low excursion rate from Cincinnati to Atlantic City, N. J., which led to serious reductions on all trunk lines between Cincinnati and New York, has been sharply criticised in various quarters, but the traffic officers say in defence that all the other prominent lines out of Cincinnati have been running equally cheap excursions east, northeast and north, and that its own action was therefore no more than just to its patrons.

The Southern Pacific is reported to have inaugurated a boycott against the Delaware, Lackawanna & Western, alleging that that road does not settle promptly for tickets sold over the Southern Pacific. The Southern Pacific has also applied to the Commissioners of the Western Traffic Association for relief from the action of either the Lackawanna or its connections in paying excessive commissions on west-bound emigrant business, so that the Atlantic division of the Southern Pacific is deprived of what it regards as its fair share of the business.

The Galveston News has excited the wholesale merchants of Texas by announcing that its reporter has found, in the hands of a retail merchant in the interior, an exceedingly polite circular letter from the Merchants' Transportation Association of St. Louis, inclosing a free ticket to St. Louis. The names of a large number of St. Louis firms contributing to the fund for providing the tickets are printed on the letter, and the merchant who is thus enabled to make his purchases in St. Louis is requested to call at 81 Turner Building, 304 North Eighth street, and get his return ticket.

The Gulf, West Texas & Pacific has brought suit against the Texas Railroad Commission to set aside its ruling made some weeks ago requiring that road to run a train each way daily between Victoria and Port Lavaca. The petition alleges unconstitutionality in that section of the Commission act requiring the running of trains as ordered by the Commission. It is also alleged that the order is ruining the road and is asked to be vacated on that and other grounds. The case will be tried at the September term of the Travis county district court.

The Southern Pacific has given notice that it will not accept the 10 per cent. reduction in freight rates ordered by the Oregon Railroad Commission, but will disobey the order of the commission and make it a test case in the courts of the State. The position taken by the railroad company is that the freight rates at present in effect on its lines were fixed by the so-called Hoult act in 1885, and this act the company holds is in effect a maximum rate law. The Oregon Railroad Commission estimates that the loss to the Southern Pacific in revenue for the year 1891 on account of the reduction ordered by it will be \$5,000, while the railroad people say this loss will approximate \$250,000. The Union Pacific will probably also contest the Commission's order.

Officers of the New York Board of Trade and Transportation state that their complaint against the Trunk Lines for making lower westbound rates on freight imported from Europe than on similar shipments originating at the Atlantic seaboard will be at once taken into the courts, the obedience of the roads to the order of the Interstate Commerce Commission, secured some time ago, having been only temporary. Secretary Gardner gives these examples of present rates: Tin plate is being carried from Liverpool to Chicago for 24 cents, 12 cents of which goes to the steamship line and 12 cents to the railroad. But the tin plate rate tariff from New York to Chicago is 28 cents. Feathers are being shipped from Liverpool to San Francisco by the way of New Orleans and the Southern Pacific for \$1.07. Feathers, however, when carried from New Orleans to San Francisco are \$3.94, and from New York to San Francisco \$4.07.

The Southern Pacific officers deny any intention of antagonizing the Texas Commission, saying that traffic flows to New Orleans in spite of their establishment of a steamer line to Galveston. The railroads specially interested in Galveston traffic affirm, however, that the rates just established by the Commission will drive all the cotton to New Orleans. One of the officers in an argument before the Commission said: "The rate for 150 miles on 100 lbs. from a point in the interior via Houston to Galveston is 48 cents; from the same point of shipment to Houston, 100 miles, 38 cents; this makes a difference of 50 cents a bale, or two cents per 100 lbs. more than the local rate from Houston to Galveston. There is a \$1 a bale rate over the Southern Pacific from Houston to New Orleans. The difference of rate from Houston to Galveston being set within 50 cents, the rate to New Orleans would control every bale of cotton that stops at Houston. The center of the cotton belt is within a radius of 200 miles of Galveston, and this disadvantageous rate applies till the main cotton belt is passed; conditions are changed only where a distance is reached at which Galveston is not affected. He did not attach any importance to the withdrawal of the Morgan steamers, as but one vessel came to Galveston and that only occasionally."

Eastbound Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending Aug. 20 amounted to 50,794 tons, against 45,111 tons during the preceding week, an increase of 5,683 tons, and against 52,336 tons during the corresponding week of 1890, a decrease of 1,542 tons. The proportions carried by each road were:

	Wk. to Aug. 20.		Wk. to Aug. 22.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	6,510	12.8	6,529	14.4
Wabash.....	3,195	6.3	3,391	7.5
Lake Shore & Michigan South.....	7,587	14.9	5,732	12.7
Pitts., Ft. Wayne & Chicago.....	5,298	10.4	5,136	11.4
Pitts., Cin., Chicago & St. L.....	5,778	11.4	4,883	10.8
Baltimore & Ohio.....	3,749	7.4	2,300	5.1
Chicago & Grand Trunk.....	5,285	10.4	4,928	10.9
New York, Chic. & St. Louis.....	5,761	11.3	4,180	9.3
Chicago & Erie.....	7,631	15.1	8,032	17.8
Total.....	50,794	100.0	45,111	100.0

Of the above shipments, 2,133 tons were flour, 19,256 tons grain, 1,702 tons millstuffs, 5,107 tons cured meats, 7,791 tons dressed beef, 1,845 tons butter, 1,080 tons merchandise and 6,872 tons lumber. The lake lines carried 119,288 tons, against 118,067 tons during the preceding week, an increase of 1,201.